FINAL ENVIRONMENTAL IMPACT STATEMENT

9-FOOT NAVIGATION CHANNEL PROJECT
CHANNEL MAINTENANCE MANAGEMENT PLAN
UPPER MISSISSIPPI RIVER
HEAD OF NAVIGATION TO GUTTENBERG, IOWA

JUNE 6, 1997

LEAD AGENCY:

U.S. ARMY CORPS OF ENGINEERS, ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

VOLUME I

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188
Exp. Date: Jun 30, 1986

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION U.S. Army Eng'r Dist. St Paul 6b. OFFICE SYMBOL (If applicable) PE-M	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code) 190 5th St. E. St Paul, MN 55101-1638	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification)

9-FOOT NAVIGATION CHANNEL PROJECT CHANNEL MAINTENANCE MANAGEMENT PLAN, UPPER MISSISSIPPI RIVER, HEAD OF NAVIGAION TO GUTTENBERG, IOWA, Vol I

12. PERSONAL AUTHOR(S)

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Final EIS	FROM ____ TO ____	970606	

16. SUPPLEMENTARY NOTATION

In two volumes. Volume 2 are appendices.

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Inland Navigation Mississippi River

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

The purpose of this Environmental Impact Statement is to analyze the environmental impacts of actions proposed in the Channel Maintenance Management Plan (CMMP) for maintaining a 9-foot navigation channel, along with commercial and small-boat harbors, on the Upper Mississippi River between Guttenberg, Iowa and the head of navigation at Minneapolis, Minnesota. The proposed actions analyzed in this document include dredging; dredged material placement; recreational beach maintenance and development; repair, construction, modification, and/or removal of channel structures; clearing and snagging operations; and future site planning for dredged material placement.
Site specific social and economic effects of the CMMP range from slightly negative effects to significantly positive effects.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION Unclassified
22a. NAME OF RESPONSIBLE INDIVIDUAL Robert Whiting	22b. TELEPHONE (Include Area Code) 612-290-5256 22c. OFFICE SYMBOL PE-M

DD FORM 1473, 84 MAR

SECURITY CLASSIFICATION OF THIS PAGE

19970808 011

RECORD OF DECISION

ENVIRONMENTAL IMPACT STATEMENT, 9-FOOT NAVIGATION CHANNEL PROJECT
CHANNEL MAINTENANCE MANAGEMENT PLAN UPPER MISSISSIPPI RIVER
HEAD OF NAVIGATION TO GUTTENBERG, IOWA

The St. Paul District has developed the Channel Maintenance Management Plan (CMMP) to guide the maintenance of the 9-foot channel project on Upper Mississippi River (UMR) from the head of navigation in Minneapolis, Minnesota, to Guttenberg, Iowa, and the various commercial and small-boat harbors authorized by Congress within the District. The CMMP describes the long-term dredged material placement plans of the District and provides designated placement site(s) for all of the active dredging locations and the commercial and small-boat harbors. A final Environmental Impact Statement (EIS) addressing the environmental impacts of the proposed CMMP was filed with the Environmental Protection Agency (EPA) on April 4, 1997.

Two alternatives were evaluated in the EIS; to implement the proposed CMMP, or to implement the channel maintenance plan contained in the Great River Environmental Action Team (GREAT I) reports completed in 1980. The GREAT I plan was considered the "no action" alternative because this plan was the last approved Federal-State plan of action for maintenance of the 9-foot navigation channel project. Future tiering through the preparation of additional Environmental Assessments and/or EISs will be required for actions treated programmatically in this EIS.

The primary adverse environmental impact identified in the CMMP is the disturbance or destruction of fish and wildlife habitat as a result of dredging and dredged material placement site use. The recommended CMMP dredging and placement plan would affect approximately 2,988 acres of main channel, 360 acres of upland, 292 acres of disturbed flood plain, and 213 acres of wetland aquatic habitat. Approximately 41 acres of the 213 acres of wetlands that would be affected under the recommended plan are the result of a park development plan (Blackhawk Park). An additional 108 acres of wetland/aquatic habitat, not included in the 213-acre total, has been or would be disturbed under the recommended plan as a result of an environmental enhancement project (Weaver Bottoms) designed to enhance and rehabilitate fish and wildlife habitats (covered under separate EIS). In comparison, the GREAT I dredging and placement plan would have an impact on approximately 3,894 acres of main channel, 361 acres of upland, 281 acres of disturbed flood plain, and 477 acres of wetland habitat.

The channel management program proposed within the CMMP involves maintenance and modification of channel training structures. The initial construction of these channel structures had a substantial effect on the hydrodynamic and ecological characteristics of the UMR. Control structure maintenance and modifications will continue to have adverse impacts on wetland and aquatic resources. The channel management program will be evaluating opportunities to modify channel training structures to reduce or control dredging requirements and to restore natural river processes; enhancing habitat quality and diversity. Future planning should reduce the impacts of channelization, while providing for a more cost efficient and safer channel.

Site-specific effects on economic and social resources from dredging and placement range from slightly negative effects to significantly positive effects. Minor adverse impacts include noise pollution, increased local road maintenance, reduced visual qualities, and conflicts with recreational use. Dredging to maintain the navigation channel has significant positive impacts. The recommended plan provides for active or passive beneficial use of approximately 78 percent of the projected total material dredged (31.57 million cubic yards) over the next 40 years. Dredging maintains navigability of the 9-foot channel and allows for the movement of bulk commodities at

considerable savings to shippers over alternative transportation modes. During a typical navigation season in the St. Paul District, the navigation system generates transportation cost savings benefits of $150 to $200 million.

Definitive conclusions on the impacts of the CMMP on cultural resources cannot be drawn until cultural resources coordination and surveys have been completed for all the proposed sites under the CMMP. At this time, however, the number of known cultural resources sites affected under either plan is small.

A number of mitigation measures to avoid, minimize, rectify, or compensate potential adverse impacts of channel maintenance activities have been incorporated as part of the CMMP.

Three issues or site-specific objections continue to be controversial: the need to update the 1974 EIS on operational aspects of the 9-foot channel; the need to do a systemic cumulative impact assessment; and the use of the St. Paul Barge Terminal placement site.

Maintenance of the 9-foot channel project is part of the larger operation and maintenance program, which includes all aspects of operating and maintaining the project, including water level regulation. An EIS on the overall program within the St. Paul District was completed in 1974. No changes in the operational aspects of the 9-foot channel project are being proposed at this time.

Concerns have been expressed about the future environmental quality and ecological sustainability of the UMR and Illinois Rivers, and the need for a systemic quantitative cumulative impact assessment of the continued operation and maintenance of a 9-foot navigation channel. This issue is beyond the scope of the CMMP and Final EIS.

The St. Paul Barge Terminal site was recommended as a fourth priority site out of five sites during GREAT. The number one, two, and five priority sites have either been filled with dredged material, or are no longer available for other reasons. The third priority site (Southport Site) is being pursued for development as a long-term dredged material placement site. The Southport Site is acceptable to all agencies and has sufficient capacity to serve as a long-term site through active beneficial use removal of materials.

It is the objective of the St. Paul District to develop a long-term dredged material placement plan that does not require use of the Barge Terminal site. When the District is confident that the objective has been met, the St. Paul Barge Terminal site will be removed from the CMMP.

I find the CMMP best meets the purposes and needs of the St. Paul District in maintaining the 9-foot channel project on the UMR from Guttenberg, Iowa, to the head of navigation at Minneapolis, Minnesota, and on the lower Minnesota and St. Croix Rivers; offers the best combination of economic, engineering, and environmental considerations; is acceptable to local interests and concerned agencies; and complies with applicable laws and regulations. Accordingly, it is my decision that the best interests of the public would be served by implementation of this alternative.

Date: 7/10/97

Signature: Robert B. Flowers

ROBERT B. FLOWERS
Major General, U.S. Army
Commander and Division Engineer
Mississippi Valley Division

FINAL ENVIRONMENTAL IMPACT STATEMENT
9-FOOT NAVIGATION CHANNEL PROJECT
CHANNEL MAINTENANCE MANAGEMENT PLAN
UPPER MISSISSIPPI RIVER
HEAD OF NAVIGATION TO GUTTENBERG, IOWA

ABSTRACT

Lead Agency: U.S. Army Corps of Engineers, St. Paul District, St. Paul, Minnesota.

The purpose of this Environmental Impact Statement (EIS) is to analyze the environmental impacts of actions proposed in the Channel Maintenance Management Plan (CMMP) for maintaining a 9-foot navigation channel, along with commercial and small-boat harbors, on the Upper Mississippi River (UMR) between Guttenberg, Iowa, and the head of navigation at Minneapolis, Minnesota, in comparison to impacts of the long-term dredged material placement plan and other maintenance recommendations made by the Great River Environmental Action Team I (GREAT I) study and EIS, completed in 1980. Also included in the CMMP are proposed actions for maintaining the navigable portions of the lower Minnesota and lower St. Croix Rivers. The proposed actions analyzed in this document include dredging; dredged material placement; recreational beach maintenance and development; repair, construction, modification, and/or removal of channel structures; clearing and snagging operations; and future site planning for dredged material placement. This EIS treats both site specific impacts and programmatic impacts, where there is insufficient information to perform site specific analysis. Future tiering, through the preparation of Environmental Assessments and/or EISs, will be required to address the issues that are only treated programmatically or for changes in the specific site plans.

Implementation of the CMMP would have an impact on fish and wildlife habitats through dredging and dredged material placement site use. The recommended plan would affect approximately 2,988 acres of main channel habitat, 360 acres of upland habitat, 292 acres of disturbed floodplain habitat and 213 acres of wetland/aquatic habitat through dredging and dredged material placement site use. Approximately 41 acres of the wetland loss would occur as the result of a park development plan (Blackhawk Park). An additional 108 acres of wetland/aquatic habitat, not included in the 213-acre total, would be affected as a result of the Weaver Bottoms Rehabilitation project in pool 5 (covered under a separate EIS). Site-specific social and economic effects of the CMMP range from slightly negative effects to significantly positive effects. Approximately 78 percent of the dredged material would be used beneficially. Dredging maintains navigability of the 9-foot channel and allows for the movement of bulk commodities at considerable savings to shippers over alternative transportation modes. The numbers of known cultural resources sites affected by the proposed CMMP or the GREAT I plan are small.

For further information on this final EIS, please contact:

Mr. Robert Whiting
U.S. Army Engineer District, St. Paul
190 Fifth Street East
St. Paul, Minnesota 55101-1638
Commercial Telephone: (612) 290-5264

GLOSSARY

CEQ - Council on Environmental Quality

CFR - Code of Federal Regulations

CMMP - Channel Maintenance Management Plan

CMP - Channel Management Plan

Consultation - a formal process between a Federal agency, a State Historic Preservation Officer and the Advisory Council on Historic Preservation to consider adverse effects of a Federal undertaking on a property listed on or determined eligible for the National Register.

Cultural Resources - a broad term used to group prehistoric or historic sites, districts, buildings, structures, artifacts, or objects that fall within the disciplines of prehistoric and historic archeology, history, and architectural history.

DMMP - Dredged Material Management Plan

DNR - Department of Natural Resources

DPR - Definite Project Report

EIS - Environmental Impact Statement

EO - Executive Order

EPA - Environmental Protection Agency

ER - Environmental Regulation

GREAT - Great River Environmental Action Team

GLARC - Great Lakes Archaeological Research Center

Historic Preservation - the identification, evaluation, recordation, documentation, curation, acquisition, protection, management, rehabilitation, restoration, stabilization, maintenance, and reconstruction of historic properties, or any combination of the foregoing activities, as defined by Title III of the National Historic Preservation Act.

Historic Properties - any prehistoric or historic district, site, building, structure, or object included in, or eligible for, the National Register of Historic Places. The term includes artifacts, records, and remains related to such a district, site, building, structure, or object.

HPMP - Historic Properties Management Plan

L. higginsi - *Lampsilis higginsi,* the Higgins' eye pearly mussel

LSAF - Lower St. Anthony Falls

LTCMP - Long-Term Channel Maintenance Plan

LTMS - Long-Term Management Strategy

MNRAA - Minnesota National River and Recreation Area

MOA - Memorandum of Agreement

MPFW/OG - Most Probable Future Without GREAT

NEPA - National Environmental Policy Act of 1969

NAGPRA - Native American Graves Protection and Repatriation Act

National Historic Landmark (NHL) - a district, site, building, structure or object that the Secretary of the Interior has determined possesses exceptional value in commemorating or illustrating the history of the United States and which has been so designated under the authority of the Historic Sites Act of 1935.

National Register (NRHP) - the list of districts, sites, buildings, structures, and objects significant in American history, architecture, archeology, engineering and culture maintained by the Secretary of the Interior and fully titled the "National Register of Historic Places."

OMP - Operational Management Plan

OSIT - On-Site Inspection Team

PMOA - Programmatic Memorandum of Agreement

RRF - River Resources Forum

State Historic Preservation Officer (SHPO) - The official appointed or designated pursuant to Section 101(b)(1) of the National Historic Preservation Act of 1966 to administer the State Historic Preservation Program.

UMR - Upper Mississippi River

UMRCC - Upper Mississippi River Conservation Committee

USACE - U.S. Army Corps of Engineers, St. Paul District

USAF - Upper St. Anthony Falls

USFWS - U.S. Fish and Wildlife Service

CONVERSION FACTORS, NON-SI TO SI UNITS OF MEASUREMENT

Non-SI units of measurement used in this report can be converted to SI units as follows:

Multiply	By	To Obtain
feet	0.3048	meters
square feet	0.092903	square meters
cubic yards	0.76455	cubic meters
acres	4,047	square meters
miles	1.609	kilometers

TABLE OF CONTENTS

VOLUME I

LIST OF TABLES

LIST OF FIGURES

VOLUME II

APPENDICES

1.0 SUMMARY

The 9-Foot Navigation Channel project was authorized by the River and Harbor Act of 3 July 1930. The project provides for a 9-foot deep navigation channel achieved through the construction of locks and dams, most of which were constructed in the 1930's. Dredging in selected locations is required to maintain the channel.

In addition to the 9-foot channel, a number of commercial and small-boat harbors have been authorized by various legislation. These harbors require periodic maintenance dredging.

The St. Paul District has developed a Channel Maintenance Management Plan (CMMP) to guide the maintenance of the 9-foot channel and the commercial and small-boat harbors. The CMMP describes the long-term dredged material placement plans of the District and provides a designated placement site(s) for all of the active dredging locations and the commercial and small-boat harbors. The CMMP is an outgrowth of and an alternative to the long-term dredged material placement plan and other dredging recommendations made by the Great River Environmental Action Team I (GREAT I) study and Environmental Impact Statement (EIS), completed in 1980. The CMMP is available for review by request. Copies of the CMMP have been sent to local, State and Federal agencies and libraries throughout the St. Paul District. The CMMP is also available for review at these locations. An executive summary of the CMMP including a distribution list (see Attachment 2 of Appendix A) is provided as Appendix A. The CMMP is incorporated by reference in this EIS.

1.1 MAJOR FINDINGS AND CONCLUSIONS

The primary adverse environmental impact of the recommended plan is the disturbance or destruction of fish and wildlife habitat as a result of dredging and dredged material placement site use. The recommended CMMP placement plan would impact approximately 360 acres of upland, 292 acres of disturbed floodplain, and 213 acres of wetland/aquatic habitat. In comparison, the GREAT I placement plan would have an impact on approximately 361 acres of upland, 281 acres of disturbed floodplain, and 477 acres of wetland habitat.

Approximately 41 acres of the 213 acres of wetlands impacted under the recommended plan are the result of a park development plan (Blackhawk Park). An additional 108 acres of wetland/aquatic habitat, not included in the 213-acre total, would be disturbed under the recommended plan as a result of an environmental enhancement project (Weaver Bottoms) designed to enhance and rehabilitate fish and wildlife habitats. The effects of the Weaver Bottoms project have been assessed in a separate EIS.

Dredging under the CMMP and GREAT I plans would impact a substantial portion of the main channel aquatic habitat, 2,988 and 3,894 acres, respectively. Snag removal would have minor adverse impacts through removal of habitat structure. Maintenance of recreational beaches would have minor adverse impacts on fish and wildlife, mainly by maintaining disturbed floodplain areas in a disturbed state.

Dredging and dredged material placement will cause localized, negligible to substantial adverse water quality impacts, depending on the dredging and placement methods, quality of the dredged sediments and quality of the effluent from the disposal site. From a system standpoint, both plans would have only minor impacts on water quality. Use of most of the GREAT I or CMMP placement sites would produce minor impacts on groundwater. Some of the selected placement sites in the CMMP would require additional groundwater investigations, including well monitoring. Floodplain impacts would generally be minor, but some additional analysis would be required for some of the placement sites prior to implementation.

The Channel Management Program involves maintenance and modification of channel training structures. The initial construction of these channel structures had a substantial effect on the hydrodynamic and ecological characteristics of the Upper Mississippi River (UMR). The channel management program will be evaluating opportunities to modify channel training structures to reduce or control dredging requirements and to restore natural river processes; enhancing habitat quality and diversity. More detailed environmental evaluations and documentation will need to be completed as specific reach studies are undertaken.

Site-specific effects on economic and social resources from dredging and placement range from slightly negative effects to significantly positive effects. Minor adverse impacts include noise pollution, increased local road maintenance, reduced visual qualities, and conflicts with recreational use. In contrast to the minor negative social impacts, dredging to maintain the navigation channel has significant positive impacts. The recommended plan provides for active or passive beneficial use of approximately 78 percent of the projected total material dredged (31.57 million cubic yards) over the next 40 years. Dredging maintains navigability of the 9-foot channel and allows for the movement of bulk commodities at considerable savings to shippers over alternative transportation modes. During a typical navigation season in the St. Paul District, the navigation system generates transportation cost savings benefits on the order of $150 to $200 million.

Definitive conclusions on the impacts of the CMMP on cultural resources cannot be drawn until cultural resources coordination and surveys have been completed for all the proposed sites under the CMMP. At this time, however, the number of known cultural resources sites affected under either plan is small.

1.2 AREAS OF CONTROVERSY

Maintenance of the 9-foot channel project is part of the larger operation and maintenance program, which includes all aspects of operating and maintaining the project, including water level regulation. An EIS on the overall program was completed in 1974 (USACE 1974), however, some resource management agencies have petitioned that the 1974 EIS is outdated and should be revised/updated to reflect the changing conditions of the UMR environment.

The completion of the CMMP is viewed by some agency representatives as "fragmentation." The purpose of this EIS is to analyze and compare the environmental impacts of actions

proposed in the CMMP for maintaining a 9-foot navigation channel, along with commercial and small boat harbors, on the UMR between Guttenberg, Iowa, and the head of navigation at Minneapolis, Minnesota, to impacts of the long-term dredged material placement plan and other channel maintenance recommendations made by the Great River Environmental Action Team I (GREAT I) study and EIS, completed in 1980. Some agencies contend that the scope of the study has been narrowed. Scoping has been an ongoing iterative process since publication of the GREAT I study in 1980. Actually, the GREAT I study was itself a continuation or "tiering" of the channel maintenance plan described in the 9-foot channel operation and maintenance EIS published in 1974 (USACE 1974). As discussed further in Section 2.1 *Project Background*, the CMMP is a continuation of the channel maintenance planning process initiated by the GREAT I study. Since the completion of the GREAT I study and accompanying EIS in 1980, planning for implementation of the GREAT I recommendations has focused on development of plans for maintenance of the 9-foot channel. The scope of the study, beginning with GREAT I and culminating with the CMMP, has always been focused on maintenance of the 9-foot channel. Operation of the 9-foot channel project was never considered under GREAT I or the CMMP. It is the Corps of Engineer's position that this EIS is not fragmentation, but simply a continuation of the tiering process of the efforts of the GREAT I study and EIS. This tiering process is allowed by CEQ guidelines (40 CFR 1502.20 and 1508.20).

No changes in the operational aspects of the 9-foot navigation channel are being proposed at this time. The District will be evaluating the adequacy of the 1974 EIS on operation and maintenance of the 9-foot channel within the St. Paul District to determine if it should be revised/updated to reflect the changing conditions of the UMR environment.

Treatment of only two alternatives, the No Action Alternative (implementation of the GREAT I plan) and the CMMP Alternative, has been questioned by some agencies. Alternatives have been continuously investigated since the 1974 EIS through the GREAT I planning effort and through pool level reconnaissance reports to the CMMP. The CMMP represents an intensively coordinated program for approaching future channel maintenance. Only two alternative programs are included in the EIS because that is the decision to be made; i.e., proceed with implementation of the CMMP or revert to the GREAT I plan (No Action). A large number of alternative dredged material placement sites are evaluated in Appendix B.

It is recognized that not all aspects of the present CMMP have sufficient detail at this time to complete a site-specific analysis and, therefore, can only be treated programmatically. Future tiering through the preparation of additional Environmental Assessments and/or EISs will be required for actions only treated programmatically in this EIS.

The proposed Channel Management Plan, although recommended by GREAT I, has been viewed by some resources agencies as an attempt to canalize the river with little regard for the resulting impacts on ecosystem functions. As discussed in the 1974 EIS, past channel structure construction and modifications have had a significant impact on habitat conditions within the UMR floodplain. Control structure maintenance and modifications would continue to have adverse impacts on wetland and aquatic resources. However, reducing or controlling dredging

requirements can also reduce environmental impacts by reducing placement requirements. In planning for future channel control structure management four goals would be used in the planning effort: 1. Reduce and/or control dredging requirements; 2. Reduce cost and environmental effects; 3. Restore natural river processes; and 4. Restore and enhance habitat quality and diversity. Future planning using these four goals should reduce the impacts of channelization, while providing for a more cost efficient and safer channel.

Several site-specific objections to the CMMP were raised by the agencies and the public during review of the draft EIS. These CMMP actions are listed below. The St. Paul District's position with respect to these site-specific objections is presented in specific responses to comments received on the draft EIS in Appendix F (see Appendix F for further discussion).

o Dredging on the St. Croix River at the Kinnickinnic Narrows dredge cut: Objection by the U.S. National Park Service (NPS) - Appendix F: U.S. Department of Interior (USDOI) comments 2 - 6 (pages F-3 through F-6).

o Use of the St. Paul Barge Terminal placement site (2-837.5-RMP): Objection by the NPS, the Minnesota Department of Natural Resources (MDNR), and the Minnesota Pollution Control Agency (MPCA) - Appendix F: USDOI comment 7 (pages F-5 through F-8); MDNR comments 9 (pages F-9 and F-10) and 74 (pages F-66 through F-68); and MPCA comment 2 (pages F-95 and F-96).

o Use of the Morgans emergency placement site (3-802.3-RME): Objection by the USDOI - Appendix F: USDOI comment 13 (pages F-11 and F-12).

o Use of the Red Wing Yacht Club placement site (4-794.7-RMP): Objection by the MDNR - Appendix F: MDNR comments 12 (pages F-45 and F-46) and 103 (pages F-75 and F-76).

o Use of the Fountain City 2 placement site (5A-731.8-LWP): Objection by the USDOI and Wisconsin Department of Natural Resources (WDNR) - Appendix F: USDOI comment 13 (pages F-11 and F-12) and WDNR comment 13 (pages F-33 and F-34).

1.3 UNRESOLVED ISSUES

The major unresolved issue is the cumulative impacts of the continued operation and maintenance of the 9-foot navigation channel project. The public and resource agencies have expressed concerns about the future environmental quality and ecological sustainability of the UMR and Illinois Rivers. Because of these concerns, they have identified the need for a systemic quantitative cumulative impact assessment of the continued operation and maintenance of a 9-foot navigation channel on these waterways.

At present, there are no other unresolved issues associated with the proposed CMMP.

1.4 RELATIONSHIP TO ENVIRONMENTAL REQUIREMENTS

Table 1-1 displays the status of compliance of the proposed CMMP with the applicable environmental protection statutes and executive orders for the current stage of planning. For comparative purposes, the GREAT I plan is also displayed. Section 5.8 also provides a summary of actions that will be required prior to implementation of site specific plans proposed under the CMMP.

1.5 FURTHER STUDIES

1.5.1 Actions Covered Under Separate Environmental Impact Statements

The St. Paul District has prepared a final Environmental Impact Statement for maintenance of the East Channel at Prairie du Chien, Wisconsin, and the Prairie du Chien commercial and small-boat harbors (USACE and WIDNR 1996), which is incorporated by reference.

The St. Paul District has prepared a final Supplemental Environmental Impact Statement for the Lower Pool 5 Channel Maintenance/Weaver Bottoms Rehabilitation Plan (USACE and USFWS 1986), which is incorporated by reference.

1.5.2 Actions Being Treated Programmatically in this EIS

The St. Paul District is in the process of preparing or has prepared recreational beach development plans for the individual navigation pools on the UMR. This EIS addresses the programmatic environmental effects of maintaining a recreational beach development program. Additionally, for those plans already completed, more detailed assessments of site-specific impacts are provided. Under the tiering concept (40 CFR 1502.20), additional NEPA documents would be prepared for future beach development plans.

The District has prioritized several reaches in which channel control structures could be employed to reduce dredging requirements. These reaches would be studied following the procedures outlined in the Channel Management Plan (see Section 3.2.2.3).
The District recognizes the CMMP needs to be a dynamic plan. Therefore, the procedures used to arrive at the selected placement site plans and that would be used to complete future planning efforts are outlined in the CMMP, including identification of the coordination mechanisms to be used (see Section 3.2.2).

All the programs of the CMMP discussed in this sub-section require future NEPA compliance during subsequent planning.

Table 1-1. Status of compliance with environmental requirements.

Environmental Requirement	CMMP Plan	GREAT I Plan
Federal Statutes		
Archaeological and Historic Preservation Act	Full	Full
Clean Air Act, as amended	Full	Full
Clean Water Act, as amended	Partial	Partial
Coastal Zone Management Act, as amended	N/A	N/A
Endangered Species Act of 1973, as amended	Full	Full
Estuary Protection Act	N/A	N/A
Federal Water Project Recreation Act, as amended	Full	Full
Fish and Wildlife Coordination Act, as amended	Full	Full
Land and Water Conservation Fund Act, as amended	Full	Full
Marine Protection, Research and Sanctuaries Act	N/A	N/A
National Environmental Policy Act of 1969, as amended	Full	Full
National Historic Preservation Act of 1966, as amended	Full	Full
National Wildlife Refuge Administration Act of 1966	Full	Full
Watershed Protection and Flood Prevention Act	N/A	N/A
Wild and Scenic Rivers Act, as amended	Full	Full
Farmland Protection Policy Act of 1981	Full	Full
Executive Orders, Memoranda		
Floodplain Management (E.O. 11988)	Full	Full
Protection of Wetlands (E.O. 11990)	Full	Full
Environmental Effects Abroad of Federal Actions (E.O. 12114)	Full	Full
Analysis of Impacts on Prime and Unique Farmland (CEQ Memorandum, 30 August 1976)	Full	Full

Notes: The compliance categories used in this table were assigned according to the following definitions:

a. Full - All requirements of the statute, E.O., or other policy and related regulations have been met for the current stage of planning.

b. Partial - Some requirements of the statute, E.O., or other policy and related regulations remain to be met for the current stage of planning.

c. Noncompliance - Violation of a requirement of the statute, E.O., or other policy and related regulations.

d. Not Applicable (N/A) - Statute, E.O., or other policy and related regulations not applicable for the current stage of planning.

1.5.3 Actions Being Deferred Which May Be Pursued in Future

Thalweg placement is the placement of dredged material into the main channel of the river. There is great deal of environmental concern and many unknowns concerning this placement technique. It is not being pursued under this planning effort. However, if ongoing research and studies provide the capability to predict the fate of material disposed in this manner, the possibility of using this method would be re-examined.

The potential exists for construction of a sediment trap on the Chippewa River above its confluence with the UMR. The St. Paul District will conduct further studies to determine the feasibility of dredging an upstream sediment trap on the Chippewa River.

The Bay City small-boat harbor is located in the northern corner of Lake Pepin. The District has conducted an independent cost/benefit study of the Bay City small-boat harbor and has determined maintenance of the project is not justified. Any maintenance of the harbor has been deferred and is not included in this planning effort.

2.0 NEED FOR AND OBJECTIVES OF ACTION

2.1 PROJECT BACKGROUND

In 1930, Congress authorized the 9-Foot Navigation Channel project on the UMR, providing for a navigation channel of 9-foot depth to be achieved by construction of a series of locks and dams supplemented by dredging. Included in the project area were the lower reaches of the St. Croix, Minnesota, and Black Rivers. The majority of the locks and dams were completed in the 1930's, although the last structure, the upper lock at St. Anthony Falls, was not completed until 1963. Since the completion of the locks and dams, annual maintenance dredging has been required to maintain the navigation channel. During the period 1975-1995, the average annual dredging volume was approximately 720,000 cubic yards, ranging from a low of about 205,000 cubic yards (1977) to a high of about 1,417,000 cubic yards (1995).

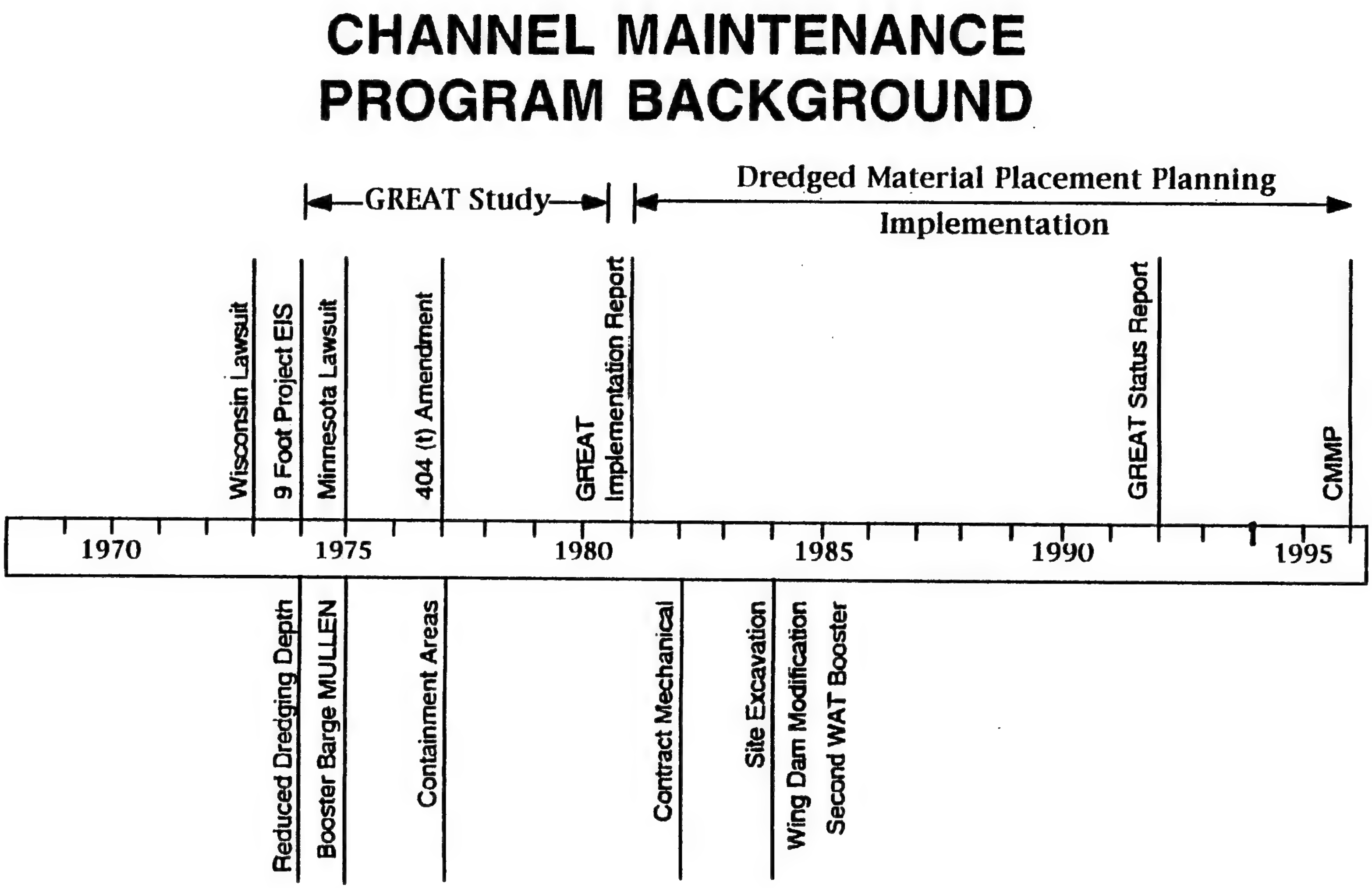
In 1974, in response to a lawsuit filed by the State of Wisconsin, the St. Paul District completed the final Environmental Impact Statement (EIS) for the operation and maintenance of the 9-Foot Navigation Channel project (see Figure 2-1). This EIS covered the entire range of operation and maintenance activities, from dredging to lock and dam operation to water level control.

During the period 1975-1980, the Great River Environmental Action Team I (GREAT I) study took place. The GREAT I study was an interagency effort involving the Corps of Engineers, the U.S. Fish and Wildlife Service, the U.S. Environmental Protection Agency, the U.S. Soil Conservation Service, the Coast Guard, and the States of Iowa, Minnesota, and Wisconsin. The primary objectives of the study were the development of a detailed site-specific channel maintenance plan and recommendations for the management of the river system and its interrelated components within the river corridor. One of the main products of the GREAT I study was a channel maintenance plan which recommended dredged material placement sites for all historic dredge cuts within the St. Paul District. An EIS was completed for the GREAT I study, addressing the GREAT I recommended channel maintenance plan and other river resource management recommendations.

In 1981, the District prepared an implementation/status report on the GREAT I recommendations. With reference to the GREAT I channel maintenance plan, the District proposed to evaluate the GREAT I recommended dredged material placement sites and alternatives, and implement those sites that further evaluation proved justified and feasible. Any modifications to the GREAT I recommended plan would be fully coordinated with the appropriate Federal and State agencies.

During the period 1982-1996, the District conducted reconnaissance studies evaluating the GREAT I channel maintenance plan and alternatives for 17 separate pool reaches. This effort was coordinated with the appropriate Federal and State agencies, primarily through the interagency Channel Maintenance Forum.

Figure 2-1. Channel Maintenance Program timeline.



With completion of the reconnaissance studies, the District has compiled the results of all post-GREAT I study efforts into a comprehensive plan for maintenance of the 9-foot navigation channel. This plan is the Channel Maintenance Management Plan (CMMP) which is the proposed action assessed in this EIS.

2.2 PROJECT AUTHORITY

2.2.1 Upper Mississippi River (UMR)

Modifications of the Mississippi River for navigational purposes began as early as 1824 when the Federal Government authorized removal of snags, shoals, and sandbars; excavation of rock at several rapids; and closing off of meandering sloughs and back channels to confine flows to the main channel. The first comprehensive modification of the river for navigation was authorized by the River and Harbor Act of 18 June 1878. A 4½-foot channel was maintained from the mouth of the Missouri River to St. Paul, Minnesota, by construction of dams at the headwaters of the Mississippi River to impound water for low flow supplementation, bank revetments, closing dams, and longitudinal dikes. In 1890, the 4½-foot channel was extended to Minneapolis, Minnesota.

A 6-foot channel was authorized by the River and Harbor Act of 2 March 1907. The additional depth was obtained primarily by construction of rock and brush wing dams designed to constrict low water flows to a narrower channel. This was further supplemented by construction of lock and dam 2 at Hastings, Minnesota, which was completed in 1930.

Congress authorized the 9-foot channel navigation project in the River and Harbor Act of 3 July 1930, to be achieved by the construction of a system of locks and dams supplemented by dredging. The project extended from the mouth of the Missouri River to Minneapolis, Minnesota. The River and Harbor Act of 26 August 1937 authorized a 4.6-mile extension of the project to ascend the Falls of St. Anthony. Although the majority of the locks and dams were constructed in the decade of 1930-1940, the upper lock at St. Anthony Falls was not completed until 1963.

2.2.2 Minnesota River

A 4-foot navigation channel on the Minnesota River to mile 25.6 near Shakopee, Minnesota, was authorized by the River and Harbor Act of 13 July 1892. Congress authorized a 9-foot channel on the Minnesota River up to mile 14.7 near Savage, Minnesota, in the River and Harbor Act of 3 July 1958. The Peavey Company maintains a 9-foot channel from mile 14.7 to its grain terminal at mile 21.8.

2.2.3 St. Croix River

A 3-foot navigation channel was authorized on the St. Croix River from the mouth to mile 51.8 at Taylors Falls, Minnesota, by the River and Harbor Act of 18 June 1878. A 6-foot channel to mile 24.5 at Stillwater, Minnesota, was authorized by the River and Harbor Act of 21 January 1927. The present 9-foot channel to Stillwater was authorized by the River and Harbor Act of 30 August 1935, and was assured as a result of completion of lock and dam 3 in 1938.

2.2.4 Black River

The River and Harbor Act of 26 August 1937 authorized a 9-foot navigation channel on the Black River at La Crosse, Wisconsin, to a point 1.4 miles above the mouth. Dredging of a channel about 300 feet wide, which is considered adequate for existing commerce, was completed in 1941.

2.3 PURPOSE AND OBJECTIVES OF ACTION

The purpose and objective of the CMMP is to provide a comprehensive and coordinated plan for maintenance of the 9-foot navigation channel on the UMR from Guttenberg, Iowa, to the head of navigation at Minneapolis, Minnesota, which minimizes and balances socioeconomic and environmental impacts. Maintenance of navigable portions of the lower Minnesota and lower St. Croix Rivers is also included in the CMMP.

2.4 CONTENT AND SCOPE OF EIS

The purpose of this EIS is to analyze and compare the environmental impacts of actions proposed in the Channel Maintenance Management Plan (CMMP) to the impacts of the long-term dredged material placement plan and other channel maintenance recommendations made by the GREAT I study and EIS, completed in 1980. This document is tiering off the GREAT I EIS, as permitted under CEQ guidelines 40 CFR 1502.20 and 1508.20. This final EIS treats both programmatic and site specific actions proposed in the CMMP. Major items in the CMMP treated on a site specific basis in this EIS include: dredging activities, placement of dredged material at designated placement sites, and snagging activities. Major items treated programmatically in this EIS include: channel control structure modifications, recreational beach development, and future alternative dredged material placement site planning. It is the intent of this EIS to provide sufficient information regarding the generic impacts of the programmatic items in the CMMP to allow decision makers to make reasonable judgements on the merits of the action at the present stage of planning. For the programmatic items of the CMMP, the CMMP and the final EIS have identified data gaps and outlined study procedures on how these gaps would be filled on a site specific basis. When these programmatic items have reached the appropriate stage of planning, additional tiering will be completed through the preparation of Environmental Assessments, site specific EISs, or EIS supplements, as appropriate. Additional

NEPA documents may also be required during planning for implementation of the site specific items of the CMMP. Some of the triggers that could dictate the need to do additional NEPA documentation are listed below.

o All items treated programatically in this document, including the items listed in Section 1.5.2 *Actions Being Treated Programmatically in this EIS.*

o All actions being deferred at present, including actions listed in Section 1.5.3 *Actions Being Deferred Which May Be Pursued in Future.*

o Actions where the results of additional cultural resources investigations indicate the proposed action could affect a historic or archealogical site.

o Actions where the results of additional endangered species investigations indicate the proposed action would affect Federal endangered or threatened species.

o Actions where the results of additional floodplain impact assessments indicate a greater level of impact than described in this EIS.

o Modifications to a placement site location or size and/or alternative placement sites, unless these modifications are covered under a categorical exclusion (Engineering Regulation 200-2-2) and/or a general or nationwide Section 404 permit.

o Changed conditions such that the assessment of impacts in this document are determined to be inadequate.

3.0 ALTERNATIVES

In 1974, under the leadership of the Corps of Engineers and the U.S. Fish and Wildlife Service, an interagency team was organized to identify and assess the problems associated with multipurpose use of the river and to develop recommendations for improved management of the river. This effort developed into the Great River Environmental Action Team (GREAT) study, which was formally authorized by Section 117 of the Water Resources Act of 1976. The study was subdivided into the three reaches of the St. Paul, Rock Island and St. Louis Districts. The St. Paul segment, referred to as GREAT I, involved participation by the Corps, U.S. Fish and Wildlife Service, U.S. Coast Guard, Environmental Protection Agency, Natural Resource Conservation Service (formerly the Soil Conservation Service), Minnesota-Wisconsin Boundary Area Commission, Upper Mississippi River Conservation Committee, Upper Mississippi River Basin Commission and the States of Minnesota, Wisconsin, and Iowa.

From 1974 through 1980, the GREAT team carried out an extensive program of research and pilot action projects, addressing total river resource requirements. The nine-volume report summarizing the study results included 112 specific recommendations directed at river resource agencies and organizations. Among the recommendations was a site specific dredged material placement plan for all material expected to be dredged during the 40-year period 1986 through 2025.

Of the GREAT study recommendations, 80 were directed at the Corps of Engineers. In response to the study, the District prepared an implementation report in 1981 that analyzed the recommendations and proposed a plan of action for implementation. Many of the 80 recommendations were subsequently implemented through incorporation into the operation and maintenance program for the 9-foot channel project. In 1992, the District completed a GREAT I Implementation Status Report and Future Program that summarized the District's achievements related to GREAT I recommendations and described future actions.

3.1 ALTERNATIVES ELIMINATED FROM CONSIDERATION

3.1.1 Cease Maintenance of Navigation Channel

Ceasing maintenance of the 9-foot navigation channel project was assessed in the final EIS for operation and maintenance (USACE 1974). The socioeconomic status of the regional economy and the natural environment of the UMR valley would be profoundly and significantly affected. Commercial navigation would be greatly reduced as a result of unreliable channel depths. A transfer of shipment of commodities to other modes of transportation would occur. Cessation of dredging would have substantial benefits to main channel habitats and organisms occupying these habitats and would eliminate the need for placement of dredged materials on upland, wetland and/or aquatic habitats. The habitat losses occurring as a result of placement of dredged material would be eliminated. Cessation of dredging would also mean the fairly substantial amount of bedload sediment annually removed by dredging would remain in the system,

potentially hastening the loss of valuable backwater habitat through sedimentation. However, sedimentation is natural process which over decades would likely result in diversification of riverine habitats. Implementation of this alternative would require a major change in the primary objectives of the project and would have such a great impact on the present socioeconomic and environmental setting that it could be considered a socially undesirable alternative.

3.1.2 Most Probable Future Without GREAT

An alternative to the GREAT I dredged material placement plan was developed in 1977. Titled the Most Probable Future Without GREAT (MPFW/OG), this plan identified placement sites the Corps would use if GREAT made no recommendations. However, because of requirements established by the Clean Water Act of 1977, this plan is no longer feasible. The Clean Water Act of 1977 requires the COE channel maintenance operations to comply with State water quality laws and regulations. Most of the sites in the MPFW/OG plan could not be used because of this requirement, rendering the plan unimplementable.

3.1.3 Limiting Dredging to 9-Foot Depths

During review of the 9-Foot Navigation Channel FEIS in the mid-1970's, and again during the GREAT I study, the reasons and authority for dredging greater than 9 feet have been questioned. The St. Paul District requested guidance concerning the authority to dredge the channel deeper than 9 feet from Corps of Engineers Headquarters (HQUSACE) in Washington. HQUSACE has verified the District's authority to dredge greater than 9 feet to maintain a reliable 9-foot navigation channel. The practical reasons for dredging greater than 9 feet are as follows:

1) Towboats and barges have been and currently are designed with a 9-foot draft. A 9-foot draft has become the *de facto* standard for commercial navigation on the UMR. The 9-foot draft vessels require some clearance with the channel bottom; thus, a channel greater than 9 feet must be provided.

2) Instantaneous monitoring and maintenance of the navigation channel are not possible. Therefore, maintenance dredging must be completed before the channel becomes unnavigable; i.e., before shoaling to 9 feet or less.

3) It is efficient to perform "advance maintenance" dredging at locations having a history of frequent shoaling. Dredging a larger volume of material in a single maintenance effort is more cost effective than dredging the same volume in two or three smaller efforts.

Because the District has the authority, and because of the practicality for dredging greater than 9 feet, the alternative of limiting dredging to a maximum depth of 9 feet was not considered.

3.2 ALTERNATIVES CONSIDERED IN DETAIL

3.2.1 GREAT I Channel Maintenance Plan - No Action Alternative

The no action alternative is normally defined as "no Federal action" (i.e. no Federal involvement). However, no Federal action, does not apply when a project involves the ongoing operation and maintenance of a Federal project. For planning purposes, Corps of Engineer's regulations (ER 1105-2-100, chap. 7, Sec. II, para. 7-4j) define the "without plan condition" as synonymous with "no action" as used in Corps of Engineers and Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) regulations. Using the "without plan condition" as the no action alternative would be applicable to this project.

The "without plan conditions" are those existing without the CMMP. For the purpose of this EIS, the "without plan condition" is defined as the recommended plan of the GREAT I study. The rationale for selecting the GREAT I plan as the "without plan condition" is that it contains the last approved Federal-State plan of action for maintenance of the 9-foot navigation channel. The St. Paul District has been implementing the GREAT I plan since 1981. A final EIS was prepared and completed for the GREAT I study. The CMMP represents a proposal by the District that differs from the GREAT I recommended plan, primarily in the implementation of long-term dredged material placement sites. The GREAT I plan provides a relevant "measuring stick" to compare with the alternatives being addressed in this EIS.

The GREAT I report, appendices, and final EIS are incorporated by reference into this EIS. Portions of the GREAT I recommended plan pertinent to the proposed action are presented below.

3.2.1.1 Dredging

The GREAT I recommendation relative to dredging and dredged material placement is primarily contained in recommended Action Item 1, which states:

"The Corps of Engineers should implement the dredged material placement plan proposed by GREAT I."

The GREAT I dredged material placement plan (DMMP) recommended placement sites for all the historic dredge cuts are listed in Section 5, Table 5-1.

The GREAT I recommendation relative to dredging equipment is contained in recommended Action Item 5, which states:

"The Corps of Engineers should request the necessary appropriations to purchase efficient dredging equipment to best accomplish all the objectives of the GREAT I Channel

Maintenance Plan. Until this equipment is available, the Corps should emphasize contract dredging to meet these objectives."

3.2.1.2 Dredged Material Placement

The GREAT I recommendation relative to dredged material placement is primarily contained in recommended Action Item 1, which states:

"The Corps of Engineers should implement the dredged material placement plan proposed by GREAT I."

Other pertinent recommendations regarding dredged material placement include Action Item 7:

"Whenever reasonable, material dredged during channel maintenance should be placed at areas accessible for removal for beneficial use purposes. Where known demand for dredged material exists, stockpile sites should be established to maximize the economic and social benefits made possible by having sand available for beneficial uses. A process should be developed and approved by an interagency committee to quickly identify and use new placement sites in order to satisfy new demands (either on a one-time or recurring basis) as they occur."

Action Item 8:

"Temporary material placement sites will be used when private or Government dredging capability to reach the GREAT I recommended CMP sites is not expected to be available before dredging is required. These sites should also be considered for use in emergency and imminent closure dredging situations as defined by GREAT I. In the selection and use of temporary sites, the following criteria shall apply:

a. Temporary sites approved by GREAT I are listed in the rationale.

b. The annual notice will include a site plan for all temporary sites, showing material placement and removal plans and appearance of the site after its use.

c. Material stockpiled at these sites will be removed by the following spring high water or as soon as possible under time and/or equipment constraints.

d. Material removed will be taken to the channel maintenance plan approved sites.

e. Temporary placement sites are not endorsed by GREAT I unless the material is excavated before any additional material placement. The additional amount placed is not to exceed the volume removed."

The sites selected for use under GREAT I are presented in Table 5-1 in Section 5.

3.2.1.3 Channel Structures

The GREAT I recommendation relative to channel structures is contained in recommended Further Study Item 2:

"A plan should be developed to use the river's sediment transport capability to cause necessary dredging requirements to occur near long-term placement sites as environmentally and economically feasible."

3.2.1.4 Snag Removal

GREAT I made no recommendations concerning snag removal. Therefore, the no action alternative for snag removal would be the continuation of the historic practices concerning snag removal.

3.2.1.5 Recreational Beach Development

The GREAT I recommendation relative to recreational beach development is contained in recommended Action Item 19:

"Primitive recreational use sites should be maintained on an interim basis until implementation of comprehensive management plans."

3.2.2 Channel Maintenance Management Plan (CMMP)

The Channel Maintenance Management Plan (CMMP) consolidates previous planning efforts into a comprehensive long-term management plan for channel and harbor maintenance related activities on the UMR. The CMMP consolidates dredged material management plans (DMMP), describes the District's long-term management strategy (LTMS) for placement site planning, discusses alternative channel maintenance techniques, and documents policies, procedures and past practices. The CMMP would be used as a comprehensive guide for the District's channel maintenance program and would inform other agencies and the public of practices and actions. The plan, while long-term in nature, is designed to accommodate new information or changes as developments occur. Revisions would be prepared, coordinated and distributed as necessary. The plan represents the District's proposal for maintenance of the UMR navigation system. Details of the CMMP are incorporated by reference in this EIS. A summarization of the key components of the CMMP is provided in Appendix A and below. Readers are advised to consult the CMMP for more detailed information on proposed channel maintenance actions and procedures. Five basic actions are proposed in the CMMP, as follows:

1) Dredging - The District proposes to actively maintain, by dredging, the dredge cuts listed in Table A-1 of Appendix A.

2) Dredged Material Placement - The District proposes to place dredged materials at the placement sites listed in Table 5-2 in Section 5 and Table A-2 in Appendix A.

3) Channel Control Structures - The District has developed a program to evaluate using the river's sediment transport capability through construction/maintenance of channel control structures to cause necessary dredging requirements to occur near long-term placement sites as environmentally and economically feasible (see Table A-4 in Appendix A).

4) Snag Removal - The District proposes to continue removing snags from authorized portions of the UMR, Minnesota and St. Croix Rivers.

5) Recreational Beach Development - The District has developed a program for comprehensive management of recreational beach sites through dredged material placement.

3.2.2.1 Dredging

The St. Paul District has historically dredged approximately 114 locations on the UMR, 7 locations on the Minnesota River, 3 locations on the St. Croix River and 14 small-boat and/or commercial harbors (see Table A-1 in Appendix A). Many of these locations were dredged following completion of the locks and dams, as the river channel re-established itself under the new pool conditions. Advances in channel monitoring and hydraulic analysis have improved the District's predictive capability in determining the need for dredging. Some of these locations no longer require maintenance, and changing channel maintenance practices have altered the criteria by which a location is considered for maintenance.

On the basis of historical patterns and current criteria for implementing a maintenance effort, 28 historic dredge cuts have been identified where maintenance dredging is highly unlikely to be required in the future and are listed as "inactive" in Table A-1 of Appendix A. No dredged material placement plans were developed for these inactive dredge cuts. If dredging should be necessary in these inactive cuts in the future, placement of the dredged material would be coordinated through the On-Site Inspection Team (OSIT) process described in the CMMP. The District anticipates dredging 86 main channel cuts and 12 harbors considered active (see Table A-1 in Appendix A).

The confluence of the Black River with the UMR is at River Mile 698.2 at La Crosse, Wisconsin, approximately 0.75 mile above the U.S. Highway 14-16-61 bridge. The authorized navigation channel on the Black River extends 1.4 miles above the confluence. A 300-foot-wide channel was dredged up the Black River in 1941. Since this time, maintenance dredging has not been required. Because maintenance dredging has not been required on the Black River in 50

years, and none is anticipated in the future, no dredged material placement plan was developed for the Black River.

Placement site planning for those cuts considered active has been completed following procedures identified in the CMMP and summarized in Section 3.2.2.2. The decision on whether a cut requires maintenance at any particular time would be based on channel conditions as determined by hydrographic surveys. To assure a 9.0-foot depth is available, the dredging process would generally be initiated when depths less than 10.5 feet are observed encroaching into the navigable channel. This would allow for the possibility of additional shoaling to occur and provide a reasonable lead time to schedule and execute the dredging. Dredging is normally conducted to depths of 11.0, 12.0 or 13.0 feet as determined by past experience and the criteria summarized in Section 5.6.1.

The majority of dredging would take place between 1 June and 1 November of each year. Once a dredging requirement is established, a dredge cut would be laid out on a survey drawing using the dimension criteria summarized in Section 5.6.1.1. The appropriate dredging equipment, based on the size of the dredging job, placement site location and characteristics, and equipment availability, would be scheduled to complete the job. A comprehensive dredging schedule and summary of pending and completed dredge events would be maintained for the navigation season. The schedule would be routinely updated based on overall channel condition information and the priority, sequence and availability of equipment.

The general dredging schedule would be periodically distributed to other agencies through the On-Site Inspection Team (OSIT), to keep them informed of the overall dredging workload. A site-specific dredging notice would be distributed when dredging plans and details were finalized. Coordination and notification procedures are discussed in greater detail in Appendix A and Section 3.5.2 *Program Coordination.*

3.2.2.2 Dredged Material Placement

Planning for long-term dredged material placement involved the development of alternative dredged material management plans for each of the pools in the District. The post-GREAT I planning effort for dredged material placement identified approximately 120 different placement sites, and resulted in the development of approximately 95 alternative placement plans for individual pools or reaches.

It is District policy to develop and implement dredged material management plans that satisfy the long-term placement needs for Corps navigation projects. The proposed framework for dredged material management plan development is a five-phase approach as summarized below and described in detail in the CMMP. This approach has guided the District in developing the proposed CMMP and would be followed for planning future channel maintenance actions.

1. Phase I - Evaluate Existing Management Options: Study boundaries are set for the geographic area and time period to be analyzed. Dredging needs are estimated in terms of volumes, frequency and dredged material characteristics. Demand for beneficial use of the dredged material is estimated. These projections result in an estimated site(s) capacity required for the time period studied.

2. Phase II - Formulate Alternatives: Alternatives are systematically developed for feasible management options that include structural and nonstructural techniques for reducing dredging requirements, and placement site alternatives. Data needs are identified and collected as necessary.

3. Phase III - Detailed Analysis of Alternatives: A detailed evaluation, screening, and selection of a preferred long-term dredged material placement site is conducted. It is a comparative assessment analysis that weighs and balances engineering, economic, and environmental factors and benefits. The purpose is to select the most practicable plan that consists of one or more alternatives, and to document that selection process.

4. Phase IV - DMMP Implementation: Implementation of the selected plan is initiated with consideration of the administrative, procedural, management, and monitoring requirements. Environmental documentation is completed for the life of the plan; permits, easements and agreements are obtained; site preparation is accomplished as needed; and placement is initiated.

5. Phase V - Periodic Review and Update: The plan is periodically reevaluated based on factors such as changing regulations, economics or environmental conditions. Technological advances may also result in changes to the plan. The review process also verifies the validity of any assumptions made in the planning process. Changes in dredged material management needs can be anticipated and accommodated through this phase.

In all cases, the GREAT I recommended DMMP served as the baseline for comparison of alternative plans.

Placement sites are identified by a 3-part alphanumeric code denoting the pool, river mile, side of the navigation channel, State where the site is located and site type designation. For example, site 7-714.1-LWP is located in pool 7 at river mile 714.1 on the left descending bank of the navigation channel in the State of Wisconsin and is a permanent placement site. Sites located in Minnesota and Iowa are noted by the letters "M" and "I", respectively. Temporary, emergency and in-water rehandling sites are noted by the letters "T", "E", and "I", respectively.

To assist readers in identifying particular sites, the GREAT I site number and common names (if they exist) are included in various locations throughout the EIS. The District proposes to use the placement sites listed in Table 5-2 in Section 5.

3.2.2.3 Channel Structures

The GREAT I study and subsequent investigations identified a number of locations where modifications to channel structures would improve safety or reduce dredging requirements. During the 1980's and 1990's, the St. Paul District implemented projects at Winter's Landing (pool 7), Lansing Upper Light (pool 9), Jackson Island (pool 10) and Sommer's Chute (Pool 7) where wing dams were modified or constructed to realign the navigation channel to reduce dredging requirements and improve safety.

The District has developed a Channel Management Plan intended to serve as a comprehensive guide for planning, scheduling, prioritizing and budgeting non-dredging channel maintenance related work on the St. Paul District's portion of the UMR. Channel control structures are the wing dams, closing dams, trailer dams, shoreline protection and any other features (including sediment traps) constructed to maintain the channel alignment or constrict flows to improve the sediment transport efficiency through a reach of the river. Rehabilitating, restructuring or supplementing these features is a key component of efforts to reduce dredging requirements or control where and when dredging takes place. Repair, maintenance, and construction work related to these features would be studied, coordinated and completed following the process outlined in the plan. The primary objective of the plan, to reduce or control dredging requirements, would achieve environmental and economic benefits. Other objectives include providing a safer navigation channel, using the river's energy for moving sediment to more strategic placement site locations, reducing shoreline or dredged material placement site erosion that is affecting channel maintenance, and correcting channel maintenance situations that are causing adverse impacts. A related objective of this program is to increase knowledge of sediment transport characteristics for applications to the dredging program. This should result in better decisions on dredging dimensions, predicting dredging requirements and understanding placement site impacts. Although specific goals and objectives would vary depending on project location, four broad goals would likely be recurring: 1) reducing channel maintenance dredging requirements in the identified study reach, 2) reducing the cost and environmental effects of channel maintenance dredging in the identified study reach, 3) restoring and enhancing natural river processes to the greatest extent possible and 4) restoring and enhancing habitat quality and diversity in the identified study reach.

There are many locations in the District where channel control structures have been identified for potential repair, maintenance or improvement. Table A-4 in Appendix A provides the District's schedule for planning and implementation activities for the first 5 years of the Channel Management Plan. Some channel management activities such as repair/maintenance of existing structures or shoreline protection are relatively straightforward or minor in scope, and might not require significant preconstruction study and design. For more complicated projects, the process would be more involved, typically beginning with a scoping phase. The scoping phase would include problem identification, establishment of objectives, definition of the study area, and other steps necessary to begin a study. By definition, scoping involves identifying and initiating coordination with other interested Government agencies and the public. The scoping phase

would culminate in the preparation of a Problem Appraisal Report (PAR) which would include: 1. Problem Identification; 2. Definition of the Study Area; 3. Identification of Planning Opportunities and Constraints; 4. Definition of Goals and Objectives; 5. Formulation of Preliminary Alternatives; and 6. Preliminary Evaluation of Alternatives.

The preliminary evaluation of alternatives would be conducted using available information and best educated estimates to assist in the early screening of alternatives. The goal would be to eliminate from further consideration those alternatives that appear to be technically infeasible, environmentally unacceptable, cost prohibitive, or otherwise not worthy of further evaluation. Data collection for this phase of the planning process may be necessary, but would be kept to the minimum possible. A Problem Appraisal Report (PAR) would be prepared to document and summarize the scoping and early project planning. The PAR would screen the potential project alternatives as much as practicable. Endorsement of the PAR by the River Resources Forum (RRF) would be requested.

Once the PAR was endorsed by the RRF, a second phase, the plan evaluation and selection process, would be completed. The evaluation and selection process would culminate in preparation of a Definite Project Report (DPR) and appropriate NEPA document. The proposed procedures to complete the plan evaluation and selection process are as follows: 1. Develop Remaining Alternatives; 2. Compare Alternatives; and 3. Select Preferred Alternative. The proposed action would be described in detail in a Definite Project Report. The DPR would include a description of the project planning process, NEPA documentation, a Section 404(b) Clean Water Act Evaluation, and a plan for construction.

Throughout the development, planning, and construction of projects, coordination with numerous agencies, local interests, and general public would be completed.

3.2.2.4 Snag Removal

Maintenance of the navigation channel includes authority to remove snags impeding or adversely affecting navigation. On the UMR, snag removal is rarely required because of the depth and size of the river.

On the St. Croix River below Stillwater, Minnesota, snag removal requirements are essentially nonexistent because of the water depths and water body size. Above Stillwater, up to the head of the 3-foot navigation channel at river mile 51.8, snag removal is occasionally required to maintain the channel for recreational boat passage. Snag removal on this portion of the St. Croix River is only pursued at the request of the National Park Service. Snags are usually dragged off the channel and left in a location where they can continue to provide habitat for fish and/or wildlife, depending upon the situation. Since establishment of the Lower St. Croix National Scenic Riverway in 1972, snag removal has been accomplished only in 1991 when the National Park Service requested several snags be removed from a single location.

On the Minnesota River, snag removal is performed more frequently because of a narrower channel and a greater incidence of trees falling into the river from eroding banks. Snags are cleared to the head of the 4-foot navigation channel at river mile 25.6 near Shakopee, Minnesota. On the Minnesota River, snags are usually placed on the riverbank near the removal site. Typically, snagging operations are required every 2 years, where 15 to 20 snags at 7 or 8 locations are removed.

There are 3 general options for snag placement: 1) drag the snag out of the channel and leave it in the water (current practice with most snags on the UMR and St. Croix River); 2) remove the snag from the channel and place it on the riverbank out of the water (current practice on the Minnesota River and on occasion on the other two rivers); and 3) remove the snag from the channel and haul it to an on-land collection point for placement such as burning or landfilling (rarely done under current practices).

3.2.2.5 Recreational Beach Development

Dredged material can be used to maintain or create beaches for recreational use on the UMR. However, often times reshaping of beaches with existing material is all that is required to enhance a recreational beach. These beaches are popular with recreationists, but if improperly conducted, beach maintenance or creation can have adverse effects on natural resources. The St. Paul District is in the process of developing recreational beach development plans for each navigation pool on the UMR.

From a programmatic perspective, two alternatives are available: to continue to develop and eventually implement recreational beach development plans on the UMR; and to abolish the program of recreational beach development on the UMR.

Recreational Beach Development Program - Under this program, recreational beach development needs and sites would be identified, site plans developed, and dredged material used to create and/or maintain beach sites in accordance with the site plans.

No recreational beach development program would be implemented on the lower Minnesota River because it is not suited to this type of development. No program would be implemented on the St. Croix River, since the normal use of dredged material on the St. Croix River is for beach nourishment. Therefore, it is addressed under "Dredged Material Placement."

No Recreational Beach Development Program - Under this alternative, the St. Paul District would have no program to use dredged material for recreational beach development. Some dredged material would still be used on occasion for beach nourishment, but to a lesser degree than if a program were in place. There would be no plans for beach development, and in their absence, beach nourishment approval would be unlikely.

3.3 COMPARISON OF ALTERNATIVES

3.3.1 Dredging

The dredge cuts to be maintained under both the GREAT I and CMMP are listed in Table A-1 of Appendix A. Placement site planning was completed for 112 dredge cuts under GREAT I. Site planning was completed for 86 main channel dredge cuts and 12 commercial and small-boat harbors under the CMMP (Table A-1).

Under the GREAT I plan, maintenance dredging would disturb substrates in an estimated 3,894 acres of main channel habitat. Comparably, the CMMP would disturb an estimated 2,988 acres of main channel habitat. An estimated 147,620 acres of aquatic habitat exists in the St. Paul District's portion of the UMR and the navigable portions of the Minnesota and St. Croix Rivers. Excluding the USAF and LSAF pools, approximately 8.4 percent (12,356 acres) is classified as main channel habitat (see Table 5-5 in Section 5). Both plans would disturb a substantial portion of the main channel habitat present. However, only 2.6 percent and 2.0 percent of the total aquatic habitat present would be disturbed under the GREAT I and CMMP plans, respectively.

Most wildlife species endemic to the river do not make extensive use of the main channel. However, the main channel habitat is important for native mussels, many endemic species of fish, as overwintering and nursery habitat for catfish, and for other species specific uses. Dredge cuts are generally located in areas of rapid shoaling, and the unstable nature of habitat that this presents limits the value of these areas to main channel organisms. As a result, the impacts of either plan on fish and wildlife would be small. The CMMP would have slightly lesser impacts than the GREAT I plan.

Anticipated impacts on water quality are generally related to the equipment type used to complete a dredging job. Hydraulic equipment tends to have a lesser impact on water quality at the dredge cut site than mechanical equipment. Both equipment types have relatively minor effects on water quality. Both plans would have relatively minor impacts on water quality at the dredge cut site. However, the CMMP emphasizes the use of Government hydraulic dredging equipment which, as discussed, has lesser impacts on water quality than mechanical equipment. Additionally, fewer cuts are considered active under the CMMP. While both plans would result in minor impacts on water quality, the CMMP would have lesser impacts than the GREAT I plan.

The economic benefits of maintaining the 9-foot channel project are significant. The navigation channel offers a competitive alternative for long-haul movements of bulk commodities. A recent study conducted as part of the ongoing Upper Mississippi River - Illinois Waterway Navigation Study has identified transportation cost savings for typical barge movements ranging up to $35.00 per ton versus the least costly alternative. Average savings amount to about $9.00 per ton. During a typical navigation season in the St. Paul District, the navigation system generates transportation cost savings benefits on the order of $150 to $200 million.

To attain these benefits, the infrastructure must be operated and maintained. For FY 1997, funding to operate and maintain the Mississippi River project in the St. Paul District amounts to $42,346,000. Of this, $14,998,000 is scheduled for lock maintenance, $15,019,000 for lock operations, and $9,476,000 for channel maintenance. These figures are considered fairly representative of annual expenditures. Major maintenance and major rehabilitation projects are included in the lock maintenance category and dredging is included in the channel maintenance category. These expenditures are funded by the Federal government.

Both plans would result in maintenance of the project. As a result, the benefits of maintaining the 9-foot channel project under either plan do not provide a tool for comparison of the plans. However, because fewer cuts are considered active under the CMMP, the cost of dredging under this plan would be less than under the GREAT I plan.

3.3.2 Dredged Material Placement

The dredged material placement sites for the GREAT I plan and CMMP are listed in Tables 5-1 and 5-2, respectively, in Section 5.

As discussed previously, impacts on water quality are generally related to the equipment type used to complete a dredging job. In contrast to impacts at the dredging location, hydraulic equipment tends to have a greater impact on water quality at the placement site than mechanical equipment. Mechanical equipment, for the most part, has no effect on water quality during placement. With hydraulic placement, an effluent return is generated, and when discharged to the riverine environment, has adverse impacts on water quality. In general, both plans would have relatively minor impacts on water quality as a result of dredged material placement. However, the CMMP emphasizes the use of Government hydraulic dredging equipment which, as discussed, has greater impacts on water quality than mechanical equipment. However, fewer cuts are considered active under the CMMP. Both plans would have only minor impacts on water quality.

Placement of dredged materials at the sites selected under the CMMP would adversely impact approximately 213 acres of wetlands, 292 acres of disturbed flooplain habitats and 360 acres of upland. Comparative figures for the GREAT I plan include 477 acres of wetland, 281 acres of disturbed floodplain habitats and 361 acres of upland. These figures do not include the wetland acres affected by the Weaver Bottoms Rehabilitation project. From an ecosystem basis, the impacts of both the CMMP and GREAT I plans on biological productivity and habitat diversity and interspersion would be minor. However, on a local or in some cases regional basis, the impacts would be substantial to significant. Approximately 123,705 acres of wetlands, 4,200 acres of disturbed floodplain habitats and 50,988 acres of upland are present within the St. Paul District's portion of the UMR and the navigable portions of the Minnesota and St. Croix Rivers (see Table 5-6 in Section 5). Under the CMMP, approximately 0.2 percent of the wetland habitat present would be essentially converted to upland habitat. Under the GREAT I plan, approximately 0.4 percent of the wetland habitat present would be converted to upland habitat.

While both plans would have substantial impacts on aquatic, upland and wetland habitats, comparatively the CMMP would convert fewer acres of wetlands to upland and overall would affect fewer total acres.

Site-specific effects on economic and social resources from placement range from slightly negative effects to significantly positive effects. Operation of a dredged material placement or stockpile site in or near a residential area creates a number of social concerns, including noise, increased local road maintenance, and reduced visual qualities. In addition, dredging and disposal can conflict with recreational use. In contrast to the minor negative social impacts, dredging to maintain the navigation channel has significant positive impacts. The recommended plan provides for active beneficial use of approximately 16.77 million cubic yards of dredged material, or 52 percent of the projected total (31.97 million cubic yards) over the next 40 years. Additionally, approximately 8.2 million cubic yards (26 percent) would be used in a passive beneficial use manner (i.e., construction of islands as part of Weaver Bottoms Rehabilitation, park development at Blackhawk Park, and other in-floodplain uses). Comparative figures for active beneficial use under the GREAT I plan are 16.33 million cubic yards, 45 percent and 36.42 million cubic yards.

Overall, cultural resources work would need to be completed on many of the proposed sites under both the CMMP and GREAT I plans. Without completion of this work, comparing the impacts of the two plans on cultural resources is difficult. However, some important observations about the amount of work needed to complete Section 106 requirements can be made.

<u>St. Croix River</u> - All sites under both plans would need to be coordinated with the appropriate State SHPOs; however, the likelihood of impacts to cultural resources under either plan is low.

<u>Minnesota River</u> - Dredging to maintain existing channels should be reviewed to consider the potential for unknown shipwrecks along the Minnesota River. All selected sites in the Minnesota River pool would need to be coordinated with the MNSHPO. Any currently approved site the District plans to expand should be coordinated with the MNSHPO as well.

<u>Upper St. Anthony Falls</u> - Use of the proposed sites would have no effect on cultural resources but would require coordination with the MNSHPO. One site falls under the CMMP and one under GREAT.

<u>Pool 1</u> - The MNSHPO has approved use of all sites under both plans. There is no difference in cultural resource impacts between the CMMP and GREAT plans.

Pool 2 - Only three sites, 2-836.3-RMP (2.13; Southport), 2-836.8-RMP (2.14; Holman Field) and 2-821.0-LMP (2.35), have been approved by the MNSHPO for use. Southport and Holman Field are recommended/selected under both the CMMP and GREAT I plan for the same number of acres under each. Site 2-821.0-LMP (2.35) is recommended under the GREAT I plan. Until all other sites have been coordinated, a reasonable comparison of alternatives cannot be made.

Pool 3 - Two of the 9 GREAT sites have been approved. Three would require archeological survey work and 7 of 9 (including the one to be surveyed) would require coordination. Two of the 10 CMMP sites have been approved. One would require survey work and coordination, while 7 others would require only coordination. To compare the effect on cultural resources of the two plans would require completing the surveys for the GREAT and CMMP sites.

Pool 4 - The SHPOs have approved 12 of the 15 GREAT sites and 8 of the 13 CMMP sites. Of the remaining GREAT sites, 2 would require further survey work, and of the remaining CMMP sites, 1 would require further survey work. One GREAT site and 4 CMMP sites require initial coordination. Until the survey work is completed, comparison of the two plans for effects on cultural resources cannot be completed.

Pool 5 - Other than Site 5-749.8-RMP (5.24; West Newton Chute), which is proposed under both plans, there is little difference between the GREAT I and CMMP plans and potential effects on cultural resources. Site 5-749.8-RMP has the potential for a National Register of Historic Places site and must be carefully evaluated.

Pool 5A - It is unlikely that use of any sites would affect cultural resources under either the GREAT plan or the CMMP. Site 5A-738.2-RMP (5A.36; L/D 5 Site) would require coordination.

Pool 6 - Under both plans, 2 of the 3 dredge disposal sites would require further coordination, however, in each case the likelihood of finding cultural resources is small. It appears that neither plan would significantly affect cultural resources.

Pool 7 - Although the SHPOs approved the use of Sites 7-714.1-LWP (7.06; Trempealeau) and 7-713.1-RMP (7.05; Hot Fish Shop), the fish ponds at these sites were not evaluated. Given the significance of the fishponds at Guttenberg, Iowa, these ponds should be evaluated. The GREAT alternative calls for using many more acres for each site, and if the ponds are significant, this could be an important difference. Given the potential for cultural resources associated with early lumbering, further survey work has been recommended for Site 7-707.3-RMP (7.25A; Dakota Boat Ramp), a CMMP site.

Pool 8 - All three sites have been approved for use under the CMMP. All but one of the GREAT sites have been approved. Site 8-684.7-LWP (8.22; Stoddard) would have to be surveyed. As cultural resources have been found at this disposal site, the CMMP would have less impact on cultural resources.

Pool 9 - All the CMMP sites have been approved, although Site 9-670.5-LWP (9.55; Blackhawk Park) has been conditionally approved only. Any proposed work at this site that goes below the level tested in 1982 would require a survey and cultural resources evaluation. Four of the 13 GREAT sites would require further coordination and possibly surveys. Since the CMMP would affect fewer acres and all the sites have been approved, the potential to affect cultural resources is less.

Pool 10 - Because of the high potential for archeological sites being located in pool 10, both plans would require further archeological survey work and cultural resource coordination. Under the CMMP, four sites would require survey work and two would require coordination to finalize approval. Given previous work on the latter two sites, approval should be forthcoming. Under GREAT, six sites would require survey work and one would require coordination to finalize. Overall, the GREAT plan, with the survey work required for site 10-646.5-LWP (10.16; Gordon's Bay Landing), would require more cultural resource work, but the potential to have an effect on cultural resources cannot be determined without further analysis.

More detailed discussion of the cultural resource survey work required under both plans and the site specific potential impacts on cultural resources can be found in Section 5.0 and Appendix B.

3.3.3 Channel Control Structures

A planning process has been outlined in the CMMP to systematically study dredging locations in the UMR to determine where rehabilitating or constructing channel control structures would minimize the environmental and socioeconomic costs associated with dredging and dredged material placement. The GREAT I plan recommended that planning be completed to "use the river's sediment transport capability to cause necessary dredging requirements to occur near long-term placement sites as environmentally and economically feasible." The planning process outlined in the CMMP was completed in response to this recommendation. Programmatically, the CMMP outlines a procedure for planning channel structure modifications which is consistent with the GREAT I recommendations; as a result, the programmatic impacts of the two plans in regard to channel control structures would be identical.

Channel control structures are an alternative to continued dredging and dredged material placement. The primary environmental concern associated with channel structures is the disruption of hydraulic process and the potential long-term effects on habitat diversity. Channel structure modifications would result in changed flow patterns and sedimentation patterns and rates, with potential adverse impacts on environmental resources. The site-specific impacts of a channel structures development plan would be evaluated during plan preparation and in required NEPA documents.

3.3.4 Snag Removal

Removing snags from the river has negative effects by removing habitat structure. Placing the snags on riverbanks can have beneficial effects by providing additional habitat for wildlife. Following is a summary of the general effects of the three placement methods.

Placement Method	Aquatic Habitat	Terrestrial Habitat	Erosion Control
Leave in water	minor beneficial	neutral	minor beneficial
Place on bank	minor adverse	minor beneficial	minor beneficial
On-land placement	minor adverse	minor adverse	no effect

3.3.5 Recreational Beaches

Recreational beach development provides recreational benefits, and in most instances, would have little impact on fish and wildlife and other resources. Placement of materials on recreational beaches provides an alternative to placement at other sites with benefits accrued to recreational resources which would otherwise go unrealized. Often recreational beaches can be enhanced through reshaping of existing beach configurations, with little resulting on-site impacts.

3.4 PROPOSED ALTERNATIVE

Maintenance of the 9-foot channel project as outlined in the CMMP is the selected alternative. The proposed actions under this alternative include:

1) DREDGING - The proposed action is to dredge only those cuts which meet current criteria and to primarily employ Government hydraulic, Government mechanical, and contractor mechanical equipment.

2) DREDGED MATERIAL MANAGEMENT - The proposed action is to use the placement sites identified in the CMMP (see Table 5-2 in Section 5).

3) CHANNEL STRUCTURES - The proposed action is to implement all feasible channel structure modifications using the planning procedures identified in the CMMP. This EIS addresses the programmatic environmental effects of the proposed channel structures program. Because additional study is necessary to prove feasibility and develop specific plans, the impacts from implementing these measures can only be discussed in general terms. Under the tiering concept (40 CFR 1502.20), project specific NEPA documents would be prepared prior to project implementation.

4) SNAG REMOVAL - The proposed action is to continue snag removal on the UMR, Minnesota, and St. Croix Rivers as currently practiced. The decision to remove snags would be made on a case-by-case evaluation. On the St. Croix River, snags would be removed by request

of the National Park Service. Snag placement would be determined on a case-by-case basis. On the UMR and St. Croix Rivers, snags would be dragged to off channel areas. On occasion, snags would be taken to shore and left as is, cut up for firewood, or disposed of in an acceptable manner. On the Minnesota River, snags would be placed on shore.

5) RECREATIONAL BEACHES - The proposed action is to maintain a recreational beach development program for the UMR. Recreational beach development plans would be prepared for all of the navigation pools within the St. Paul District. This EIS addresses the programmatic environmental effects of maintaining a recreational beach development program as well as the site specific impacts of plans already prepared. Under the tiering concept (40 CFR 1502.20), additional NEPA documents would be prepared for future beach plans.

3.5 MITIGATION MEASURES

Mitigation measures include functional alternatives that have been incorporated into the preferred alternative that avoid, minimize, rectify or compensate potential adverse effects. Mitigation measures have been developed as part of the CMMP.

3.5.1 Measures to Reduce Dredging and Dredged Material Placement Requirements

Through a combination of mitigative measures described in Section 5.6, projected 40-year dredged material volumes have been substantially reduced from both the without and with GREAT I projections. Dredging of many historical and GREAT I dredge cuts has been deferred because of these mitigative measures (see Appendix A and Section 5.6). The mitigative measures include critical evaluation of channel dimensions (width and depth), increased channel monitoring, assistance to the U.S. Coast Guard in channel marking, and increased equipment capability through increased Government plant and contracting.

3.5.2 Program Coordination

There are a number of methods discussed below that the District uses to facilitate the coordination process to provide the best overall placement site planning and to mitigate potential impacts.

The On-Site Inspection Team was organized during the GREAT study to provide a mechanism for timely coordination of dredging events and channel maintenance activities with field level State and Federal resource managers. It also allows local communities and other organizations involvement in the program. It is valuable for providing information on proposed actions to agencies at a review level where it can be immediately evaluated for potential impacts.

The River Resources Forum is an outgrowth of the GREAT study for continuing interagency cooperation. Participating Federal agencies are: Corps of Engineers, Fish and Wildlife Service, Coast Guard, Environmental Protection Agency, Natural Resource Conservation Service

(formerly the Soil Conservation Service) and National Park Service. State agencies include the Department of Natural Resources and Departments of Transportation from Minnesota, Wisconsin and Iowa and the Minnesota Pollution Control Agency. The group has established goals and procedures for working together cooperatively that are described in a 1991 partnership agreement and accompanying operating procedures, signed by all participating agencies. The RRF is used to build consensus for proposed actions and to streamline administrative procedures. For the channel maintenance program, it provides a mechanism by which the District can obtain the collective endorsement and support of other agencies when selecting new placement sites or implementing channel modification activities.

3.5.3 Dredging and Placement Site Mitigation

3.5.3.1 Water Quality Mitigation Measures

To ensure that placement of dredged material does not result in unacceptable water quality impacts, routine sediment quality monitoring would be/is conducted to define the mitigative measures necessary for a given placement site. In areas with contaminant concerns (i.e., Minnesota River, pools USAF, 1, 2 and 3 and harbors), dredging is either completed mechanically, or potentially contaminated sediments are hydraulically dredged and placed in confined placement sites, equipped with drop structures, to maximize effluent quality and minimize water quality impacts.

3.5.3.2 Cultural Resource Mitigation Measures

Where placing dredged material on a National Register of Historic Places archeological site is necessary, and no human burials are involved, the Corps would undertake coordination with the appropriate Native American tribes, the State Historic Preservation Office (SHPO), the Advisory Council on Historic Preservation (Council), and other interested parties to develop a Memorandum of Agreement (MOA) detailing the appropriate mitigation. Mitigation generally includes excavations to determine the extent and nature of an archeological site so it can be recorded and studied later. Mitigation can include the publication of a report and/or the publication of a scholarly article or brochure describing the site. The level of mitigation depends upon the significance of the site.

Where placing dredged material on a National Register of Historic Places archeological site is necessary, and Native American burials are involved, the Corps would have to undertake extensive and close coordination with the appropriate Native American tribes, the SHPO, the Council, and other interested parties to determine the appropriate mitigation. Through consultation, all the above parties would develop an MOA to detail the needed mitigation. Mitigation could range from taking steps respectful of the burials while placing the dredged material to excavating the burials and reburying them at another location.

Where a placement site has Native American burials on it but the associated archeological site does not merit inclusion on the National Register, the District would still have to carry out extensive and close coordination with the appropriate Native American tribe or tribes.

3.5.3.3 Economic and Social Resource Mitigation Measures

Operation of a dredged material placement or stockpile site in or near a residential area creates a number of social concerns, including noise, increased local road maintenance, reduced visual qualities, and other concerns. Measures would be taken, where appropriate, to ameliorate these concerns. These efforts could include fencing, plantings, and limiting hours of operation. Sites or portions of sites no longer used would be considered for shaping and planting to improve aesthetics and increase fish and wildlife values. Vegetative screening of permanent placement sites would be completed, when determined necessary and appropriate.

A major objective of the District is to place material at locations where it can be used productively, either directly at the location where it is placed or removed and beneficially used elsewhere. Maximizing beneficial use, besides providing economic benefits to the user, reduces the environmental consequences of future placement.

3.5.3.4 Fish and Wildlife Resource Mitigation Measures

In planning for placement sites, the required site size was minimized to the extent practicable by stacking the material higher, while balancing operation, water quality, social, and other concerns. At certain placement sites, restrictions on timing have been incorporated into the plan to minimize environmental effects, including potential disturbance of bald eagle nesting and winter roosting activities.

Protection measures are needed at many locations to minimize erosion from wind, waves and flowing water. Measures include vegetative plantings, fencing, walls and rock protection as determined by individual site requirements. Filling of a site would progress in a logical manner as influenced by the location of the dredge cut and site characteristics such as topography and configuration. When possible, only that portion of larger sites needed for conducting an efficient placement operation would be prepared (i.e., diked, cleared) and used at a given time. The remaining area would be left undisturbed until use becomes necessary. Site capacity would be monitored to determine when additional planning is necessary for selecting a future replacement site.

Environmental damages resulting from emergency dredging and placement would be rectified as soon as possible and to the extent practicable.

3.5.3.5 Wetland Mitigation Measures

The District understands the site planning process used has resulted and could result in the selection of an alternative that includes unavoidable impacts on wetland habitat. At a national level, the Corps of Engineers does not have an established policy for mitigation of unavoidable wetland impacts resulting from operation and maintenance of existing projects. It is the District's position that authority for mitigation exists and therefore a District-wide policy has been developed and is incorporated into the CMMP as Appendix B - District Mitigation Policy. The District believes the CMMP would represent a condition evolved from previously approved plans prepared prior to mitigation requirements or authority. The CMMP was developed without the benefit of considering mitigation requirements in the evaluation process and therefore those requirements should not be applied at this time. Implementation was agreed to and has been initiated at nearly all of the sites in the plan. Avoid and minimize measures applied in the planning process have successfully reduced the projected wetland impacts of the CMMP to 40 percent (approximately 213 acres) of the approved dredged material placement plan contained in the GREAT I study. It is anticipated that even further reductions in projected wetland impacts would result through good management efforts during implementation. The District's policy is that compensatory mitigation is not required for impacts associated with implementation of the 1996 version of the CMMP. Any future proposed wetland impacts that differ from the 1996 CMMP projections would be compensated for in accordance with the established policy.

3.6 FURTHER STUDIES

3.6.1 Actions Covered Under Separate Environmental Impact Statements

3.6.1.1 Maintenance of East Channel at Prairie du Chien, Wisconsin

At Prairie du Chien, Wisconsin, the river divides into two navigable channels. The west channel is the shortest and straightest of the two routes and supports nearly all navigation traffic. Use of the East Channel is limited to barge traffic to and from the commercial harbors at Prairie du Chien, and to recreational traffic. The St. Paul District last dredged the East Channel in 1976. Use (including maintenance dredging) of the East Channel for navigation traffic has become controversial because it contains one of the largest populations of the endangered Higgins' eye pearly mussel (*Lampsilis higginsi*).

The District has prepared a channel maintenance plan for maintenance of the East Channel. A final Environmental Impact Statement addressing the impacts of this plan as well as the impacts of a permit application to expand and develop a private harbor in the East Channel was completed in January 1996. A Record of Decision identifying the District's proposed actions for maintenance of the East Channel was signed by the District Engineer on April 2, 1996. The proposed course of action for maintaining the East Channel includes continued dredging of the northernmost cut in the East Channel and deferred maintenance of the cut or area immediately in front of the Federal commercial harbor (City Dock).

3.6.1.2 Maintenance of Prairie du Chien Commercial and Small-boat Harbors

See discussion above.

3.6.1.3 Lower Pool 5 Channel Maintenance/Weaver Bottoms Rehabilitation Plan

The GREAT I recommended placement plan for lower pool 5 was to use dredged material from lower pool 5 to rehabilitate Weaver Bottoms. Weaver Bottoms is a 4,000 acre backwater lake in pool 5, that has experienced significant declines in vegetation since the 1960's. A plan to implement the GREAT I recommendation, including an EIS supplement, was developed and prepared in 1986 (USACE and USFWS 1986). Implementation of the plan was broken down into two phases, with phase I completed in 1987. A final report on the monitoring and recommendations for the Phase II effort is scheduled to be completed in 1997.

3.6.2 Actions Being Treated Programmatically in this EIS

The St. Paul District is in the process of preparing recreational beach development plans for the individual navigation pools on the UMR. A programmatic assessment of the impacts of the recreational beach development program is provided in this EIS. Additionally, for those plans already prepared, more detailed site specific assessments are provided.

The District has prioritized several reaches in which channel control structures could be employed to reduce dredging requirements. These reaches would be studied following the procedures outlined in the Channel Management Plan (see Section 3.2.2.3).

The District recognizes that the CMMP needs to be a dynamic plan, because of potential changing conditions (i.e. changes in beneficial use demands, changes in dredging requirements, changes in the distribution of Federally endangered species or a new listing, discovery of an important cultural resource at one of the selected placement sites, unacceptable floodplain impacts, changes in Federal, State, and local regulations etc.). Therefore, the procedures that have been used to arrive at the selected placement site plans and that would be used to complete future planning efforts are outlined in the CMMP, including identification of the coordination mechanisms that would be used (see Section 3.5.2).

All the items of the CMMP that are discussed in this sub-section would require future NEPA compliance during subsequent planning.

3.6.3 Actions Being Deferred But Which May Be Pursued in Future

3.6.3.1 Thalweg Placement of Dredged Material

Thalweg placement is the placement of dredged material into the main channel of the river. The basic concept is that the material is placed in portions of the main channel where it will not

interfere with navigation; i.e., channel reaches with depths greater than 15 feet. Natural forces are allowed to disperse the material, most likely incorporating it into the normal bedload sediment transport system.

There are few locations in the St. Paul District where extended deep water suitable for thalweg placement is present close to historic dredge cuts. In addition, environmental concerns with the impacts of thalweg placement on water quality and the eventual fate of the material (e.g., would it end up disturbing or destroying valuable habitat?) make this placement method questionable. The existing capability to predict sediment movement is low. Therefore, thalweg placement is not considered as a dredged material placement alternative for this planning effort; however, if ongoing research and studies provide the capability to predict the fate of material disposed in this manner, the possibility of using this method would be reexamined.

3.6.3.2 Upstream Sediment Trap on the Chippewa River

The potential exists to dredge a sediment trap on the Chippewa River above the confluence of the Chippewa River and the UMR. It could reduce dredging requirements, costs, and environmental effects in lower pool 4 and pool 5. The District will conduct further studies to determine if it is practical and justifiable.

3.6.3.3 Maintenance of Bay City Small-boat Harbor

The Bay City small-boat harbor is located in the northern corner of Lake Pepin. Excessive sedimentation has occurred in this area. Future maintenance of this harbor would require extensive dredging of fine sediments to provide access to the harbor. A dredged material placement problem would result due to the fine nature of the sediments and the dredging location. The District has conducted an independent cost/benefit study of the Bay City small-boat harbor and has determined maintenance of the project is not justified. Any maintenance of the harbor has been deferred and is not included in this planning effort.

4.0 AFFECTED ENVIRONMENT

Extensive descriptions of the study area's physical and biological resources are provided in USACE (1974), GREAT (1980) and USACE (1993a). An environmental resource inventory of the UMR was completed by Burns and McDonnell, Inc. under contract with the USACE (USACE 1995a). This inventory lists and describes important environmental resources within the District, including soils, vegetation, wetlands, lakes, tributaries, fish and wildlife, endangered species and important or unique habitats. The Affected Environment section of this final Environmental Impact Statement (EIS) presents a summarization of the descriptions provided in the above documents. For more detailed accounts of the physical and biological aspects of the study area, the reader is advised to consult these documents. For more detailed accounts of the archeological and historical environment, the reader is advised to consult the 1996 report on the UMR completed by Great Lakes Archeological Research Center (Overstreet et. al. 1996) and the draft Historic Properties Management Plan being written by the St. Paul District. The 1996 GLARC report contains both an overview of the UMR's culture history and a compilation of the known archeological sites and many of the historical sites on the UMR.

4.1 UPPER MISSISSIPPI RIVER (UMR)

4.1.1 General Setting of UMR

The study area for this EIS extends from the Head of Navigation at Minneapolis, Minnesota, downstream to Guttenberg, Iowa, a distance of 243.6 river miles (RM). This reach of the UMR is managed as part of the District's 9-foot navigation channel project and has 13 locks and dams constructed by the Corps of Engineers as part of that project. Also included in the study area are the lower 24.5 miles of the St. Croix River, the lower 14.7 miles of the Minnesota River, and the lower 1.4 miles of the Black River. These river segments are also managed as part of the 9-foot channel project.

4.1.2 Geology of UMR

Over 400 million years ago, alternating layers of dolomite, shale, and sandstone were deposited on the bed of a vast inland sea, forming the bedrock of most of the UMR basin. During the Pleistocene ice age, which began about 1 million years ago, advances and retreats of ice lobes shaped the present floodplain of the Mississippi River and its tributaries. The Wisconsin glaciation is the most recent and most important in the formation of the UMR basin. Wisconsin glacial drift covers nearly all of Minnesota, Wisconsin and northern Iowa. During much of the Wisconsin glaciation, drainage of glacial meltwaters was blocked to the north and east, creating glacial Lake Agassiz and resulting in tremendous flows through the UMR drainage system. These flows generally carried a small sediment load compared to the size of the discharge, giving the water tremendous erosive capabilities. As a result, the river valleys of the Minnesota and Mississippi Rivers were deepened and widened by glacial River Warren far beyond the apparent needs of present-day discharges. As the Wisconsin glacier retreated, drainage to the north and east was re-established, resulting in a decline in the volume and velocity of meltwaters coursing

the UMR valley. As River Warren ebbed, the sediment-carrying capability of the Mississippi River also declined. Glacial outwash, primarily sands and gravels, partially refilled the UMR valley. Subsequent river action incised and modified outwash deposits, leaving a terraced valley and meandering floodplain.

4.1.3 Climate of UMR

The climate of the UMR basin is typically continental, having long cold winters, warm humid summers, and short fall and spring seasons. Average temperature varies from about 45° F to less than 40° F from south to north, while normal precipitation varies from less than 20 inches per year in the prairie, to more than 36 inches per year in the northeast. About 20 percent of this precipitation falls between November and March. Average wind velocities range from 6 to 12 miles per hour with storm winds exceeding 50 miles per hour. Generally, summer winds are southerly, bringing tropical air to the region. Winter winds bring cold Arctic air masses.

The climate of the UMR valley downstream of pool 4 is moderated because the floodplain is only about 550 feet above sea level and is flanked by bluffs which rise as high as 650 feet above the valley floor. As a result, winters are less severe at Winona, Minnesota, for example, than in Rochester, Minnesota, only 45 miles to the west.

4.1.4 Soils of the UMR

The depth to bedrock in the UMR valley varies from exposure at St. Anthony Falls in Minneapolis, to over 150 feet in pool 10. The majority of the valley has been filled with glacial outwash composed of sands and gravels. Soils in the UMR basin vary from the northeastern well-leached soils, which have a shallow organic layer and are typical of moist forests, to poorly leached soils having a deep organic layer in the prairie southwest.

The soils of the floodplain in pools 4, 5, 5A and 6 are generally alluvial and vary in texture from silty clay to sand. The composition of the soil depends upon the manner in which the soil was deposited. The strata are composed of clay, silt, sand, and gravel and are irregular. Sand and gravel strips border most sloughs, but the larger elevated areas between the sloughs are covered with heavy silty loam underlain with sand or gravel. Prior to impoundment, these silty tracts were managed for hay.

Soils of pools 7 and 8 have been derived from a variety of parent materials such as weathering bedrock, glacial till, alluvium, and loess. In the majority of the study area, the soils are derived from the covering materials, mostly glacial till. The weathering of the till has taken place under different vegetative influences resulting in several soil types. Podzolic soils have formed under deciduous trees with grass cover. The bog soils are represented in this area by muck and peat and are predominant on the lower edges of terraces in the river basins. Alluvial soils are formed from material recently deposited in floodplains. Regosols consist of deep, soft mineral deposits having few or no clearly expressed soil characteristics

developed. A loess cap lies over parent material and is composed of silt-sized particles uniform in distribution and chemical composition.

Pool 9 principal parent materials are loess, alluvium, and glacial drift. Numerous pockets and fans of glacial outwash formed as ice melted during the most recent Wisconsin glacial period. Many of the meltwater channels are now streams in the glacial till areas along the UMR. The main soil associations of pool 9 are the Fayette and the Fayette-Dubuque-Stonyland (FDS). The FDS association contains a higher percentage of shallow limestone soils on steep, stony land than the Fayette soil association, with the limestone often exposed on the steep slopes, making them susceptible to erosion. The sediment load carried into pool 9 by the Upper Iowa River produces siltation which accumulates in backwater areas and into the navigation channel. The major soil type of islands and upland peninsulas is Dorchester silt loam with zero to 1 percent slope. This soil is light colored, lacks a B horizon, and is built up on black buried soil with some layers of sand in areas. The bottomland soils are flooded nearly every year during spring thaw or after heavy rains prior to the growing season.

Upland soils of pool 10 were developed mainly from loess, and vary from deep rich loam under prairie or maples, to leached podzolic soils under oak-hickory woodlands. Some of the high terraces have sandy loam soils developed under prairie vegetation. The bottomlands have diverse soils of alluvial origin. Most are composed of layers of sand, silt, and clays deposited by flooding events. In areas of annual flooding, there is little soil development since humus material is removed or covered. The higher lands on the terraces may have an A layer. A gley layer of sticky fine clay with blue-green mottling from reduced iron is present in all bottomland soils. It indicates poor internal drainage and anaerobic soil conditions.

4.1.5 Watershed of UMR

The UMR and its tributaries drain an area of approximately 80,000 square miles. Of this total, 45,000 square miles are in Minnesota, 32,000 are in Wisconsin, and the remainder are in South Dakota and Iowa. In the St. Paul District, the UMR drops 60 percent of its total fall. Some of the UMR's main tributaries include the Minnesota River which joins at Fort Snelling in pool 2; the St. Croix River which joins at Prescott, Wisconsin, in pool 3; the Chippewa River at the lower end of pool 4; the Zumbro River below lock and dam 4; the Black River at Lake Onalaska in pool 7; the Upper Iowa River in upper pool 9; and the Wisconsin River in pool 10.

4.1.6 Sedimentation on UMR

Sedimentation is a natural occurrence in all river systems and results from weathering and erosion of rocks and soils. In the UMR, sedimentation is due primarily to erosion. Land erosion by water can be divided into two general processes, sheet or upland erosion and channel erosion. Sheet erosion occurs on upland areas and primarily contributes fine-grained particles to the river, while channel erosion occurs along well-defined channels and primarily contributes coarser particles.

Sediment is transported by water as suspended load or as bedload. The suspended load consists of fine-grained particles (clay, silt, fine sand) held in suspension by turbulence of flowing water. Bedload consists of coarser particles which roll, slide or bounce along the streambed. Sheet erosion is the primary source of sediments in the UMR, and as a result, the suspended sediment load is considerably larger than the bedload. The bedload carried by streams in the UMR varies between zero and 40 percent of the total sediment transported, generally being about 10 percent. Coarse materials being transported as bedload tend to shoal in certain channel reaches, depending on the physical characteristics of the bed material and on local streamflow energy and hydraulic factors. Bedload materials comprise the major portion of materials requiring maintenance dredging.

If the equilibrium of a stream is disturbed by factors affecting flow, slope and sediment load, such as structures within the floodway or changes in sediment influx, the sediment carrying capacity of the stream will be affected. The works associated with the 9-foot channel project are examples of disturbances that have affected the sediment transport regime of the UMR. Construction of the locks and dams caused reduced velocities in many portions of the river. Lower velocities translate to lower sediment carrying capacity for sand and silt, resulting in increased sedimentation. The navigation pools are acting like sediment traps, and are gradually filling with sediment. The GREAT I Sedimentation and Erosion Work Group determined that sedimentation in pools 4 through 10 is occurring at a rate of about 2.5 to 5.0 centimeters per year.

The gradual filling of the navigation pools is reducing the quantity and quality of backwater pool areas. Sedimentation reduces the storage capacity of these areas and may cause increases in flood crests that can further destroy habitats. Sedimentation can also isolate backwater sloughs, lakes, and ponds from oxygenated river flows.

In contrast, the wing dams and closing dams were designed to increase the UMR's sediment-carrying capacity by raising the quantity and velocity of flow in the main channel. These structures concentrate flows in the main channel, promoting scour and transport of sediments.

The main tributaries to the UMR, including the Minnesota, St. Croix, Chippewa and Wisconsin Rivers, contribute significant quantities of bedload and suspended sediments to the UMR. The bedload sediment in pools above Lake Pepin is derived from sources along the UMR above Minneapolis, the Minnesota River and the St. Croix River. The UMR deposits all its bedload and a substantial portion of its suspended load in Lake Pepin.

The Chippewa River is a major source of bedload materials in the pools immediately below Lake Pepin, possibly including pool 6. An estimated 350,000 to 550,000 tons of bedload materials per year are contributed to the UMR by the Chippewa River (USACE 1974). The heaviest dredging requirements in the District are experienced in the 20-mile reach below the mouth of the Chippewa River. This reach accounts for 45 percent of the average annual quantity in approximately 7 percent of the District's geographic area of responsibility.

Over 80 locations in the District have required channel dredging since 1970. The frequency and volume of dredging vary by location. TAB 2 of the CMMP includes a summary of dredging locations and pertinent event statistics.

Sediment samples from nearly all the historic dredging locations, including commercial and small-boat harbors, in the District have been collected periodically. A summarization of the sediment quality detected throughout the District is provided in Appendix D and TAB 5 of the CMMP.

4.1.7 Water Quality of UMR

A variety of substances, both point and non-point in origin, determine and/or affect the water quality of the UMR. Municipal, industrial and storm sewer discharges, as well as agricultural runoff, contribute both organic and non-organic pollutants to the UMR. Major tributaries such as the Minnesota, Chippewa and St. Croix Rivers have a marked effect on the water quality of the UMR.

The Minneapolis-St. Paul metropolitan area is the most highly urbanized area in the District, affecting all facets of the river ecosystem. Extensive industrial development, and discharge of pollutants to the river (approximately 100 dischargers are within the metropolitan area), have created water quality problems in the past. However, measures to improve water quality (e.g. improvements in wastewater treatment techniques and facilities, regulation of point source discharges, etc.), have resulted in overall improvements in water quality. Increased dissolved oxygen levels and the return of mayfly hatches to the metropolitan portion of the UMR are evidence of these water quality improvements. Water quality generally declines from Upper St. Anthony Falls to pool 2, with the Minnesota River contributing high sediment and nutrient loads originating from farmlands in southwestern Minnesota and the Metropolitan Wastewater Treatment Plant discharge at St. Paul contributing nutrients, fecal coliform bacteria, traces of heavy metals, suspended solids, and other dissolved minerals. Turbidity and suspended solids found in this segment of the river typically do not affect common non-contact recreational uses of the river. However, high fecal coliform levels, turbidity, the developed nature of the shorelines, heavy use by commercial barge traffic, high current velocity and the general perception of "dirty" water make the river unattractive for water-contact recreational uses.

About 30 miles below St. Paul, in pool 3, the St. Croix River joins the UMR. In contrast to the Minnesota River, the St. Croix is a relatively clean river, draining forested areas of Wisconsin and Minnesota to the north. Consequently, water quality improves greatly below the mouth of the St. Croix. In addition, the pools, backwaters, and lakes along the river tend to act as sediment traps, catching pollutants adsorbed to suspended sediments. Water quality from pool 3 to upper pool 4 is good for recreational uses such as boating and sightseeing. This reach of the river is a recovery zone where water quality improves with increasing distance from the metropolitan area, particularly downstream of the confluence with the St. Croix River. Water quality parameters generally meet standards for fisheries and recreation, with the exceptions of fecal coliform bacteria, suspended solids, and PCB's.

Lake Pepin in pool 4 acts as a natural settling basin for silt and organic sludges carried in from upstream. As a result, water quality in Lake Pepin is poor. The Chippewa River, which joins the UMR in lower pool 4, drains a large area of northwestern Wisconsin and contributes large volumes of coarse sediment to the UMR.

Except for Lake Pepin and the upper reaches of pool 4, the UMR has good water quality throughout pools 4, 5, 5A, 6, 7, 8, 9 and 10. Except in isolated sloughs and backwater lakes, dissolved oxygen levels remain high year-round.

The Minnesota Department of Health maintains fish consumption advisories for several species of fish taken from the UMR. Most advisories are in response to PCB contamination, although mercury contamination is noted in some areas. The Minnesota Pollution Control Agency maintains a number of ambient monitoring stations throughout the UMR. Data from these stations is available from the U.S. Environmental Protection Agency's STORET water quality database.

The most important aquifers in the UMR basin are glacially derived subsurface deposits of sand and gravel and various underlying carbonate and sandstone rock stratas. All the towns, cities and most communities downstream of the Twin Cities obtain their municipal water supplies from deep wells in the Jordan, Dresback and Hinckley sandstone aquifers. Recharge to most aquifers is sufficient to sustain present uses. Wells placed close to rivers, lakes or streams will, in most cases, induce water to flow toward the wells. Most wells supply a medium hard water; with low to moderate concentrations of dissolved solids, sulfates, bicarbonates, iron and chloride.

Well depth is an important factor in water quality. Surficial wells are more susceptible to contamination by land-use practices than deep wells, which tend to be somewhat protected from surface contamination. Although the alluvium in the floodplain of the UMR contains adequate supplies of water, all of the larger towns and cities as well as the majority of smaller communities in the floodplain obtain their potable water from underlying bedrock aquifers, depending on stratigraphic position. In more concentrated population areas the water in the alluvium has been contaminated. Many private wells do obtain water from the alluvium where the water is judged suitable for potable or industrial use.

More detailed discussions of UMR water quality can be found in USACE (1974) and GREAT (1980b).

4.1.8 Aquatic, Wetland and Terrestrial Habitats of UMR

4.1.8.1 Aquatic Habitats

The system of locks and dams completed as part of the 9-foot channel project created a series of step-like pools on the UMR. Construction of the locks and dams abruptly changed the character of the river, impounding water over many areas and stabilizing water levels. While spring floods still occur, the river bottoms do not dry out in the summer to the extent they did under

free-flowing river conditions. In most of the navigation pools, three distinct zones have developed. The upper end of each pool is essentially a near-normal river condition, where impoundment did not raise water levels to any extent. In this portion of the pools, marsh development is limited, and the old condition of sloughs and wooded islands persists. In the middle of the pools, impoundment backed water up over islands and hay meadows, dispersing the river over large areas of comparatively shallow water, resulting in extensive marsh development. In the lower end of each pool and immediately above each dam, water was impounded to a depth which precluded marsh development. At present, these areas are essentially deep, open water. However, prior to inundation, the forests at the foot of each pool were clear cut. As a result, the pool areas contain expansive fields of submerged or partially submerged stumps.

The operation and maintenance of the pools includes the manipulation of the facilities to raise, steady, or lower water levels. Project pool elevations are maintained at the control point, usually near the middle of the pool. The water surface profile of the pool pivots around the control point as flow through the pool varies.

The UMR is a dynamic system providing diverse aquatic habitats. These habitats vary from the turbulent tailwaters below the locks and dams to the lake-type habitats above the locks and dams. To better describe the various habitat types present along the river, the major habitat types found in each pool have been classified into seven basic categories. The aquatic habitat definitions for classifications 1 through 6 below are the same as those used in the "Upper Mississippi River Habitat Classification Survey" (Sternberg 1971), which was sponsored by the Upper Mississippi River Conservation Committee (UMRCC), Fish Technical Section.

4.1.8.1.1 Main Channel

The main channel includes only that portion of the river through which large commercial craft can operate. It is defined by combinations of river regulating structures (wing dikes), riverbanks, islands, buoys, and other markers. It has a minimum depth of 9 feet and a minimum width of 400 feet. A current always exists, varying in velocity with water stages. Bottom type is mostly a function of the current. Main channel sediment consists mostly of sand, but in certain areas, sediments contain considerable amounts of fines and gravel. In general, the upper pool sections usually have a sand bottom, changing to silt over sand in the lower section of each pool. Occasional patches of gravel or rock are present in a few areas. Most of the main channel is subject to scouring action during periods of rapid water flow and by the passage of towboats in shallower stretches. No rooted aquatic vegetation is present.

4.1.8.1.2 Main Channel Border

The zone between the 9-foot navigation channel and the main riverbank, islands, or submerged definitions of the old main river channel defines the main channel border. It includes all areas in which wing dikes occur along the main channel. This area is commonly thought of as being part of the main channel, but for fisheries purposes it is considered a separate habitat. Buoys often

mark the outer edge of this zone. Where the main channel is defined only by the bank, a narrow border still occurs, and often the banks are riprapped. The wing dams, closing dams, and shoreline protection of main channel border areas provide excellent habitat for invertebrates and other benthic organisms, and are used by numerous fish species. Dredged material has been placed in some sections of this zone, sometimes covering wing dikes and riprap shorelines. The bottom is mostly sand in the upper sections of the pools and silt in the lower sections. Little or no rooted vegetation is present. This zone provides some of the better seasonal fishing along the river.

4.1.8.1.3 Tailwaters

Tailwaters include the main channel, main channel border, and areas immediately below the navigation dams where turbulence is caused by the passage of water through the gates of the dams and out of the locks. Since these areas change in size according to water stage, an arbitrary lower boundary for fishery purposes has been set at a distance of one-half mile below the dams. The bottom is sand to cobble, and no rooted aquatic vegetation is present. With the exception of scour holes immediately below the locks and dams, tailwater habitat is very similar to natural river rapids. Tailwaters provide food and fast, highly oxygenated water and are used by species such as walleye, sauger, paddlefish, and white bass.

4.1.8.1.4 Side Channels

These include all departures from the main channel and main channel border in which there is a current during normal river stage. The graduations in this category are widespread, ranging from fast flowing watercourses with high banks to sluggish streams winding through marsh areas. Unless they are former main channels, the banks are usually unprotected. Undercut or eroded banks are common along side channels near their departure from the main channel. This occurs mainly in the upper sections of the pools where banks are high and current is swift. Closing or diversion dams are often present where the side channel leaves the main channel or main channel border, and infrequently at other locations. In the impounded section of the river, these dams are mostly submerged. The bottom type usually varies from sand in the upper reaches to silt in the lower. In the swifter current there is no rooted aquatic vegetation, but vegetation is common in the shallower areas having silty bottoms and moderate to slight current.

4.1.8.1.5 River Lakes and Ponds

These areas are formed by fluvial dams, oxbows, or isolated loops or meanders, lakes formed in depressions in the floodplain, lakes formed between a natural levee and a scarp, and lakes formed due to the action of man (i.e., large, open water areas just upstream of navigation dams). In UMR studies, only those lakes having some connection with the river during normal water stages are usually considered. River lakes and ponds may or may not have a slight current, depending on their location. Most bottoms are mud or silt, often consisting of a layer 2 or more feet thick. These waters may have an abundance of rooted aquatic vegetation, both submerged and emergent, and may be surrounded by marshland.

4.1.8.1.6 Sloughs

Sloughs often border on the lake or pond category on one side and on the side channel category on the other. They may be former side channels that have been cut off or that experience only intermittent flows. They may be relatively narrow branches or offshoots of other bodies of water. Sloughs are characterized by having no current at normal water stage, muck bottoms, and possibly an abundance of submerged and emergent aquatic vegetation. Sloughs often provide good examples of the natural and man-induced ecological succession which is changing the river from aquatic to marsh habitat. Sloughs contain variable sediment types, but generally contain less sand and gravel than main channel areas.

Olson and Meyer (1976) estimated the acreage of various aquatic habitats within the floodplain of the UMR for pools 1 through 10 based on Sternberg's (1971) definitions. Table 4-1 presents estimates of aquatic habitat, wetland and upland habitat acreages for pools Upper St. Anthony Falls through 10. The Upper and Lower St. Anthony Falls pools were not included in their assessment; however, the UMR in this area is relatively confined with little or no floodplain development. Therefore, only three aquatic habitat types--main channel, main channel border and tailwater--are found within these pools.

Open water aquatic habitat comprises approximately 45 percent of the total pool acreage of the UMR between Minneapolis and Guttenberg (Table 4-1). Lake/pond habitat is the most abundant aquatic habitat in this reach of the UMR, representing approximately 47 percent of the open water aquatic habitat total. Main channel and main channel border habitat represents approximately 9 and 14 percent, respectively, of the open water aquatic habitat.

4.1.8.2 Wetlands

Wetlands are ecotones (transition zones) between open water and uplands. Wetlands possess three essential characteristics: hydric (saturated) soils, vegetation adapted to such soils and sufficiently wet conditions to maintain hydric soils and vegetation. Within this category, broad wetland classes found within the UMR floodplain include bottomland forests and inland fresh meadows (type 1 and 2 wetlands) and fresh marsh wetlands, consisting of type 3, 4 and 5 wetlands (Shaw and Fredine 1956).

Bottomland forest habitat is one of the more abundant habitat types within the UMR floodplain. Bottomland forests are typically only seasonally flooded. The soil is without standing water during most of the growing season, but is waterlogged within at least a few inches of the surface. Species composition is primarily cottonwood, black willow, elm, silver maple, box elder, green ash and river birch.

Inland fresh meadows are similar to bottomland forests in that their soils are waterlogged, although flooding occurs only on a seasonal basis. Vegetation typically found on fresh meadows includes carex, rushes, redtop, reed grasses, manna grasses, prairie cordgrass and mints.

Table 4-1. Aquatic, wetland and upland acreages, Pools 1 through 10 UMR, Minnesota and St. Croix Rivers (Olson and Meyer 1976; USACE 1983).

Pool	Aquatic Habitats							Wetlands		
	Main Channel	Main Channel Border	Side Channel	Slough	Lake/Pond	Tailwater	**Subtotal Open Water**	**Type 1, 2 Wetlands**	**Type 3, 4, 5 Wetlands**	**Subtotal Wetlands**
Minnesota	585	0	37	74	782	0	1,478	2,454	2,738	5,192
St. Croix	0	0	0	0	8,047	0	8,047	376	29	405
Pool 1	500	0	0	0	0	34	534	14	0	14
Pool 2	1,484	1,835	128	649	5,620	22	9,738	3,551	786	4,337
Pool 3	845	1,116	254	1,290	2,725	72	6,302	7,560	2,911	10,471
Pool 4	2,243	1,545	1,107	3,938	25,260	41	34,134	11,595	4,992	16,587
Pool 5	578	1,623	1,110	3,462	2,856	77	9,706	5,921	3,854	9,775
Pool 5A	393	651	1,099	1,844	322	122	4,431	4,086	2,723	6,809
Pool 6	696	1,637	1,004	2,568	792	85	6,782	3,640	4,026	7,666
Pool 7	477	1,535	1,288	847	6,749	135	11,031	4,375	4,326	8,701
Pool 8	1,036	2,225	3,448	4,040	5,186	92	16,027	6,066	9,236	15,302
Pool 9	1,622	2,500	1,558	6,064	12,295	33	24,072	13,866	9,953	23,819
Pool 10	1,897	4,473	1,756	3,937	2,169	81	14,313	10,581	4,046	14,627
Totals Pools 1-10	11,771	19,140	12,752	28,639	63,974	794	137,070	71,255	46,853	118,108

Pool	Disturbed Floodplain Habitats			Upland Habitats				
	Old Dredged Material	Sand	**Subtotal Disturbed Floodplain**	Upland	Agriculture	Disturbed Terrestrial	**Subtotal Uplands**	**Total Pool Acreage**
Minnesota	17	47	64	2,025	907	1,630	4,562	11,296
St. Croix	26	70	96	11	0	535	546	9,094
Pool 1	13	47	59	0	0	40	40	647
Pool 2	95	173	267	571	1,230	4,301	6,102	20,444
Pool 3	114	79	193	203	3,381	712	4,296	21,262
Pool 4	546	422	968	455	4,103	2,448	7,006	58,695
Pool 5	283	273	556	2,934	7,336	1,665	11,935	31,972
Pool 5A	251	122	373	49	568	290	907	12,520
Pool 6	106	140	246	548	388	2,488	3,424	18,118
Pool 7	146	126	272	933	577	1,248	2,758	22,762
Pool 8	204	286	490	440	601	2,450	3,491	35,310
Pool 9	248	176	423	12	1,475	1,220	2,707	51,021
Pool 10	114	79	193	36	1,405	1,773	3,214	32,347
Totals Pools 1-10	2,119	1,921	4,041	6,181	21,064	18,635	45,880	305,099

Three classes of fresh marsh wetlands, shallow (type 3), deep (type 4) and open water (type 5), can be found in the floodplain of the UMR. Fresh marsh soils are usually waterlogged during the growing season. Water depths vary from 6 inches to 10 feet. Vegetation includes grasses, bulrushes, spikerushes, cattails, arrowheads, smartweeds, pond weeds, coontail, water milfoils, water lilies and spatterdocks.

Wetlands are typically naturally fertile ecosystems which act as the transition area between open water and the shoreline. The emergent vegetation of marsh habitats, in addition to protecting shorelines, provides an important link in the life cycles of numerous organisms. These areas are used by plankton and benthos; they support furbearers such as mink, otter, and muskrat; provide cover and feeding areas for waterfowl; and are used as spawning areas by fish. Aquatic vegetation varies from dense stands to complete absence.

Little or no wetland habitat is present in pools USAF, LSAF and 1. Below St. Paul, wetland habitats increase in abundance, representing approximately 39 percent of the total pool acreage for the UMR between Minneapolis and Guttenberg (Table 4-1).

4.1.8.3 Disturbed Floodplain Habitats

Areas previously disturbed by past dredged material placement are prevalent in the floodplain of the UMR. Recreational beach areas and areas covered with old dredged material in various stages of revegetation are the two most typical habitat types in this category. Prior to their use as dredged material placement sites, these areas were likely floodplain forest, wet marsh or main channel border habitat. However, placement of dredged material on these sites has permanently disturbed and in most case eliminated the wetland characteristics of these sites. These disturbed areas occupy approximately 1.3 percent of the total pool acreage of the study area (Table 4-1).

4.1.8.4 Terrestrial Habitats

Terrestrial habitats within the floodplain of the UMR in the District include areas of forest, brush and shrub areas, upland meadows, areas disturbed by commercial or residential development and agricultural land. Each of these areas can support a diversity of species, and these areas are important parts of the overall ecosystem.

Most of the UMR is contained within an ecotone between prairie vegetation types and mixed deciduous-coniferous forests. Plant life in the UMR valley shows an overlapping of eastern and western species. Several high "sand prairie" areas are scattered along the river valley, offering habitat conditions normally found much farther west. The climate moderation also allows more southern plant species to extend their ranges up the river valley. Forested areas in the region are of two types: upland xeric southern forests, and lowland forests of the floodplain. Dominant tree species in the floodplain forest type are silver maple, black willow, cottonwood, American elm, and river birch. Species dominant in the better drained areas are American elm, silver maple, green ash, basswood, and black ash.

Terrestrial areas dominated by industrial, commercial or residential uses are also prevalent in the floodplain of the UMR. These areas typically show signs of earth-moving activities including roads and highways, gravel pits, coal terminals, marinas, industrial buildings, and family residences.

Agricultural areas include areas devoted to production of annual crops, pastures or landscape nurseries. Agricultural lands are generally in private ownership and are not normally saturated with water except during spring flooding in low-lying areas.

Within the floodplain of the UMR between Minneapolis and Guttenberg, upland habitats represent approximately 15 percent of the total pool acreage (Table 4-1). Agriculture and disturbed terrestrial habitats represent 46 and 41 percent, respectively, of the upland habitat total. Undisturbed upland habitats (i.e., upland meadows, forests, prairies) represent only 13 percent of the total upland habitat.

4.1.9 Fish and Wildlife Resources of UMR

The diversity of habitat along the UMR provides for a great diversity and abundance of fish and wildlife. A number of factors contribute to this diversity and abundance. A continuum of aquatic habitats ranging from fast-flowing main channel to lotic backwaters is present. The river valley is part of the Mississippi Flyway, resulting in an abundance of bird species during migration and nesting periods. The river valley lies in an ecotone between the eastern hardwoods and the prairies, resulting in an overlap of species common to these two biomes. The UMR is part of the largest floodplain river ecosystem in the northern hemisphere. As such, the UMR is a globally significant ecosystem. The abundance of fish and wildlife species present on the floodplain of the UMR is a testimonial to its significance.

4.1.9.1 Fish

Approximately 110 species, representing 22 families, occur in the UMR between Minneapolis and lock and dam 10. All are native except rainbow trout, brown trout, grass carp, carp, and goldfish. Most are warm-water species. Common game and panfish species include the walleye, sauger, northern pike, channel catfish, largemouth bass, white bass, bluegill, and white and black crappie. Common non-game fish include the freshwater drum, carp, redhorses, buffaloes, and a wide variety of minnows. The catfishes, buffaloes, and carp are the primary fish of commercial interest. Generally, fish species diversity increases from upstream to downstream, reflecting increased backwater areas, improved water quality and habitat. A complete list of fish species found in the UMR is provided in the Operational Management Plan (OMP) for the UMR (USACE 1993a).

Fish species that use main channel habitat are typically adapted to swift current; deep water; and coarse sand, gravel or rock bottom. Freshwater drum and channel catfish are common commercial fish that use this habitat type. Game fish that use main channel habitat include walleye, sauger, smallmouth bass and white bass. Although little or no rooted aquatic vegetation

is present, the rock substrates of the wing dams, closing dams and shoreline protection riprap associated with the main channel border provides excellent habitat for walleye, sauger, smallmouth bass and many other lithophilic fish species.

In contrast to main channel and main channel border habitat, river lakes and ponds or "backwaters" typically have little current and provide habitat for species better adapted to this condition. Commercial species found in backwaters include carp, bigmouth buffalo and catfish, while typical sport fish include northern pike, largemouth bass, crappies and bluegill. Deeper backwater areas with sufficient flows provide wintering areas for many of these species.

Both sloughs and side channels represent a transition between main channel/main channel border habitat and backwaters. As a result, species that use both lentic and lotic habitats are found in sloughs and side channels. Largemouth bass, smallmouth bass, bluegill, crappie and walleye use side channels and sloughs for all life functions. Rearing, wintering and spawning habitat is provided by sloughs and side channels for northern pike, white bass, carp and buffalo.

Availability of food sources and fast, highly oxygenated water are among the factors that make tailwaters valuable fish habitat. Tailwaters are particularly important areas for species such as paddlefish and sturgeon, which were largely displaced by inundation of the natural river. Tailwaters provide spawning, rearing and wintering areas for walleye, sauger, yellow perch, catfish, freshwater drum and white bass.

Twenty-four species of fish listed by at least one of the States bordering the UMR within the District (Minnesota, Wisconsin or Iowa) as threatened or endangered may be found in the UMR between Minneapolis and Guttenberg (Table 4-2). More detailed information on the habitat requirements and distribution of these species can be found in Appendix G.

4.1.9.2 Aquatic Invertebrates

The UMR contains a large, complex assemblage of invertebrate species related to the wide variety of habitats in the area. The insect fauna is dominated by immature stages of mayflies, midges, and caddisflies, indicative of high dissolved oxygen levels. Being efficient converters of detritus, aquatic insects are an important link in the food web, providing food for fish and waterfowl.

The fine-grained sediments typically deposited in backwater areas can smother aquatic organisms, especially sand dwelling invertebrates. However, invertebrates such as mayflies (Order Ephemeroptera) and fingernail clams (*Musculium transversum*) thrive in areas with adequate oxygen and silt bottoms. Mayflies provide excellent food for fish, while fingernail clams are important food items for both waterfowl (especially diving ducks) and several species of fish.

Table 4-2. State protected fish of the navigable portions of the Upper Mississippi, St. Croix and Minnesota Rivers within the St. Paul District.

		Status		
Species	Minnesota	Wisconsin	Iowa	Occurrence by Pool(s)
Black buffalo	special concern	threatened	none	4-10
Blue sucker	special concern	threatened	none	2-10, St. Croix, and Minnesota
Bluntnose darter	none	endangered	endangered	8-9
Burbot	none	none	threatened	2-5, 7-10, and St. Croix
Chestnut lamprey	none	none	threatened	3-5, 7-10, and St. Croix
Crystal darter	special concern	endangered	none	4-6 & 8
Gilt darter	special concern	threatened	none	8
Goldeye	none	endangered	none	2-10
Grass pickerel	none	none	threatened	10
Greater redhorse	none	threatened	none	2-5, 8-10, and St. Croix
Lake sturgeon	special concern	none	none	3-6, 8-10, and St. Croix
Mud darter	none	special concern	none	4-10
Paddlefish	threatened	threatened	none	2-10
Pallid shiner	special concern	endangered	none	3-5, 7-10, and St. Croix
Pirate perch	none	none	special concern	7-10
Pugnose minnow	none	none	special concern	1-10, St. Croix, and Minnesota
River redhorse	none	threatened	none	2-5, 6-10, St. Croix, and Minnesota
Skipjack herring	special concern	endangered	none	1-6 and 8-10
Speckled chub	none	threatened	none	2-10, St. Croix, and Minnesota
Starhead topminnow	none	endangered	none	8
Weed shiner	none	none	endangered	3-10
Western sand darter	none	none	threatened	3-10
Yellow bass	special concern	none	none	4 and 6-10

4.1.9.3 Freshwater Mussels

The UMR supports 48 known species of native mussels. Two distinct groups, the Sphaeriidae or fingernail clams, and the Unionidae, are found in the UMR. Fingernail clams inhabit a wide variety of substrate in water depths up to 20 feet and are an important food base for fish, waterfowl, and turtles. The Unionidae are larger mussels, requiring stable substrates of sand or gravel generally in water less than 6 feet deep, although unionids are also found in deeper habitats. Unionids are food items for raccoon, muskrat, mink, otter and fish and are important commercially for the pearl industry. Fingernail clam populations are generally sparse throughout the UMR. The lock and dam system has slowed currents, increasing siltation in many of the historic beds. Water pollution from the Twin Cities along with siltation is responsible for decimating freshwater mussel beds from Minneapolis to Lake Pepin. However, in spite of past water quality problems, freshwater mussels continue to exist in this portion of the UMR.

Main channel border habitat is the primary habitat for freshwater mussels in the UMR. The combination of suitable sand/gravel substrates and moderate current velocities is ideal for most species of mussels. Main channel areas where dredging is limited or does not occur, and side channels are also important habitats for freshwater mussels.

A recent exotic introduction, the zebra mussel (*Dreissena polymorpha*), has been observed throughout the UMR. This species could adversely affect the freshwater mussel populations of the UMR, however, the ultimate affects of this exotic species on the native freshwater mussel resource of the UMR is unclear at this time.

Twenty-two species of freshwater mussels listed by at least one of the States bordering the UMR within the District (Minnesota, Wisconsin or Iowa) as threatened or endangered may be found in the UMR between Minneapolis and Guttenberg (Table 4-3). More detailed information on the habitat requirements and distribution of these species can be found in Appendix G.

4.1.9.4 Mammals

Mammalian species found in the river valley are generally representative of eastern (Alleghenian) types, with some southern (Carolinian) and northern (Canadian) species also present. At least 59 species of mammals are known to use the UMR, including a number of aquatic mammals such as beaver, muskrat, and river otter. Some of the major upland mammals include white-tailed deer, fox, squirrels, gophers, mice, moles, voles, shrews, bats, opossum, skunks, mink, weasels, and raccoon.

The urban/agricultural nature of upland habitats within the floodplain of the UMR between Minneapolis and Guttenberg provides limited habitat for wildlife. However, several mammal species adapted to living in proximity to man do occur in the area; white-tailed deer, squirrels, muskrats, raccoons and woodchucks are common.

Table 4-3. State protected mussels of the navigable portions of the Upper Mississippi, St. Croix and Minnesota Rivers within the St. Paul District.

		Status		
Species	Minnesota	Wisconsin	Iowa	Occurrence by Pool(s)
Black sandshell	special concern	none	none	3-9, St. Croix
Buckhorn (Pistolgrip)	threatened	threatened	endangered	3, 4 & 9, St. Croix
Butterfly	threatened	endangered	none	5, 5A, 6, 7, 9 & 10, St. Croix
Ebonyshell	endangered	endangered	none	3, 4, 9 & 10, Minnesota
Elephant ear	endangered	endangered	none	3, 4, 9 & 10
Elktoe	threatened	none	none	4 & 5, St. Croix
Ellipse	threatened	none	none	4 & 5
Fluted shell	special concern	none	none	4 & 5, St. Croix
Hickorynut	special concern	none	none	4-8, St. Croix
Monkeyface	threatened	threatened	none	3-10, St. Croix
Mucket	threatened	none	none	1-7, St. Croix
Purple wartyback	threatened	endangered	threatened	3, 4, 5, 9 & 10, St. Croix
Rock pocketbook	endangered	threatened	none	5-10, Minnesota
Round pigtoe	threatened	none	none	3, 4 & 5, St. Croix
Salamander	threatened	threatened	none	9 & 10
Sheepnose	endangered	endangered	none	3, 4, & 5
Spectaclecase	threatened	endangered	endangered	9 & 10, St. Croix
Spike	special concern	none	none	3-7, St. Croix
Strange floater	none	none	threatened	9 & 10, St. Croix
Wartyback	endangered	threatened	none	8, 9 & 10
Washboard	threatened	none	none	2, 3, 8, 9 &10, St. Croix
Yellow (slough) sandshell	endangered	endangered	endangered	3, 4, 9 & 10

Upland forest and wetland habitat types support an abundance of mammal species including fox, weasel, coyote, badger, and skunks. Resident wildlife using aquatic habitats, particularly river lakes/ponds, sloughs and side channels include muskrat, beaver, mink, raccoon and otter.

Eight species of mammals listed by at least one of the States bordering the UMR within the District (Minnesota, Wisconsin or Iowa) as threatened or endangered may be found in the UMR between Minneapolis and Guttenberg (Table 4-4). More detailed information on the habitat requirements and distribution of these species can be found in Appendix G.

4.1.9.5 Birds

At least 300 species of birds, about 60 percent of the total number of species in the conterminous United States, are known to use the UMR, with over 100 nesting in the area. Waterfowl are generally considered the most important, due to their large numbers and high visibility. Approximately 30 waterfowl species use the UMR. Widgeon, mallards, scaup, canvasbacks, and wood ducks are species commonly using the river. The UMR valley is a major bird migration corridor, especially for waterfowl including swans, for the mid-continental United States. In addition to waterfowl, many of the birds using the UMR valley are migratory, making the UMR of national and international significance. The thousands of acres of marsh along the UMR are heavily used by wading birds such as herons, egrets, and other shorebirds.

River lakes and ponds are used heavily by migratory water birds including ducks, geese, herons and a large group of other species as feeding areas. Sloughs and side channels are also heavily used by these species and are also important brood and nesting areas for such species as wood ducks.

Tailwaters are primarily used by predatory species such as gulls, eagles and osprey. These areas generally remain open during the winter, providing feeding areas for raptors that overwinter in the area. Bottomland forests provide important habitat for tree-nesting ducks, such as wood ducks and mergansers, and are heavily used by songbirds and neo-tropical migrants. Meadows and prairies provide valuable pairing, nesting and feeding habitat for pheasant, wild turkey, and various other birds.

Seventeen species of birds listed by at least one of the States bordering the UMR within the District (Minnesota, Wisconsin or Iowa) as threatened or endangered may be found in the UMR between Minneapolis and Guttenberg (Table 4-5). More detailed information on the habitat requirements and distribution of these species can be found in Appendix G.

4.1.9.6 Reptiles and Amphibians

The floodplain of the UMR provides habitat for nine species of turtles, 13 species of snakes, one lizard species, two species of salamanders, one species of toad, and nine species of frogs. The more important habitats for reptiles and amphibians include the river lakes and ponds, wetlands and shoreline areas of the UMR.

Table 4-4. State protected mammals of the navigable portions of the Upper Mississippi, St. Croix and Minnesota Rivers within the St. Paul District.

		Status		
Species	Minnesota	Wisconsin	Iowa	Occurrence by County
Bobcat	none	none	endangered	Allamakee & Clayton, IA
Eastern pipistrelle	special concern	none	none	Hennepin, Houston, Ramsey, Wabasha, & Washington, MN
Least shrew	special concern	none	threatened	Winona, MN
Northern myotis	special concern	none	none	Ramsey, MN
Praire vole	special concern	none	none	Houston & Winona, MN
River otter	none	none	threatened	Allamakee & Clayton, IA
Southern bog lemming	none	none	special concern	Allamakee, IA
Woodland vole	special concern	none	none	Houston, MN

Table 4-5. State protected birds of the navigable portions of the Upper Mississippi, St. Croix and Minnesota Rivers within the St. Paul District.

		Status		
Species	Minnesota	Wisconsin	Iowa	Occurrence by County
Acadian flycathcher	special concern	threatened	none	Goodhue & Houston, MN Crawford, La Crosse, Grant, & Vernon, WI
Bell's vireo	none	threatened	none	La Crosse, Trempealeau, WI Winona, MN
Bewick's wren	none	endangered	none	Buffalo, Pepin, & Trempealeau, WI
Caspian tern	none	endangered	none	Buffalo, Grant, La Crosse, Pepin, Pierce, & Trempealeau, WI
Cerulean warbler	none	threatened	none	Buffalo, La Crosse & Grant, WI Houston, Wabasha, & Winona, MN Allamakee, IA
Common Moorhen	special concern	none	none	Houston, Ramsey, Wabasha, Washington & Winona, MN
Forster"s tern	special concern	none	special concern	Ramsey & Wabasha, MN
Great egret	none	threatened	none	All
Henslow's sparrow	endangered	none	threatened	Winona, MN
Kentucky Warbler	none	threatened	none	Crawford, Grant, La Crosse, & Vernon, WI
King Rail	none	none	endangered	Houston, MN; Allamakee, IA
Loggerhead shrike	threatened	endangered	none	Dakota, Wabasha, Washington, MN Crawford, La Crosse, Pierce, St. Croix & Vernon, WI
Louisiana waterthrush	special concern			Houston, Washington, and Winona, MN
Osprey	none	threatened	none	Buffalo, La Crosse, Pierce, St. Croix, & Trempealeau, WI
Red-shouldered hawk	none	threatened	endangered	Dakota, Goodhue & Washington, MN; Allamakee & Clayton, IA
Worm-eating warbler	none	endangered	none	Grant & Vernon, WI
Yellow-throated warbler	none	endangered	none	Grant, WI

Eighteen species of reptiles and amphibians listed by at least one of the States bordering the UMR within the District (Minnesota, Wisconsin or Iowa) as threatened or endangered may be found in the UMR between Minneapolis and Guttenberg (Table 4-6). More detailed information on the habitat requirements and distribution of these species can be found in Appendix G.

4.1.9.7 Other Invertebrates

Two insects listed by at least one of the States bordering the UMR within the District (Minnesota, Wisconsin or Iowa) as threatened or endangered may be found in the UMR between Minneapolis and Guttenberg (Table 4-7). More detailed information on the habitat requirements and distribution of these species can be found in Appendix G.

4.1.9.8 Plants

Many plant species listed by at least one of the States bordering the UMR within the District (Minnesota, Wisconsin or Iowa) as threatened or endangered may be found in the UMR between Minneapolis and Guttenberg (Table 4-8). More detailed information on the habitat requirements and distribution of these species can be found in Appendix G.

4.1.10 Federal Threatened and Endangered Species of UMR

Species with Federal threatened or endangered status that use, or that might be found on, the UMR floodplain include: the threatened bald eagle (*Haliaeetus leucocephalus*) which nests, roosts, and feeds in the area; the endangered peregrine falcon (*Falco peregrinus*) which may nest, roost, and feed in the area; the endangered Higgins' eye pearly mussel (*Lampsilis higginsi*); and the endangered winged mapleleaf mussel (*Quadrula fragosa*). The USFWS has identified the Higgins' eye pearly mussel, the winged mapleleaf mussel, the bald eagle and the peregrine falcon as species to consider when assessing the effects of implementation of the CMMP. A biological assessment of the impacts of implementation of the CMMP on threatened and endangered species has been completed with primary emphasis placed on assessing impacts on bald eagles, peregrine falcons, winged mapleleaf mussels and Higgins' eye pearly mussels (see Appendix C).

In recent years, bald eagle use of the UMR has increased dramatically. The bald eagle has expanded its distribution throughout the United States, and its protected status has been changed from endangered to threatened throughout its range. Eagles use the UMR valley year-round and require three basic habitat types: nesting, wintering, and roosting. The Minnesota DNR has identified four bald eagle roosting sites within the UMR corridor: Wacouta, Zumbro Bottoms, Reads Landing, and Gores Wildlife Management Area.

The peregrine falcon is distributed throughout North America. It nests primarily on cliffs, sides of buttes, slopes and riverbanks, occasionally in trees and man-made structures. The peregrine falcon is known to breed within the project area, but is more common during migration.

Table 4-6. State protected herpetofauna of the navigable portions of the Upper Mississippi, St. Croix and Minnesota Rivers within the St. Paul District.

Species	Status Minnesota	Wisconsin	Iowa	Occurrence by County
Blanding's turtle	threatened	threatened	none	Wabasha, Dakota, Ramsey, Goodhue & Winona, MN, Buffalo, Crawford, La Crosse, Pepin, & St. Croix, WI
Blue spotted salamander	none	none	endangered	Washington & Hennepin, MN Crawford & Grant, WI
Common musk (stinkpot) turtle	none	none	threatened	Clayton, IA
Eastern newt	none	none	threatened	Dakota, MN
Five-lined skink	special concern	none	none	Houston & Winona, MN Crawford, WI
Four-toed salamander	special concern	none	none	Houston, MN Vernon, WI
Gopher Snake	special concern	none	none	Dakota, Goodhue, Hennepin, Houston, Wabasha, Washington, & Winona, MN
Massasauga rattlesnake	endangered	endangered	endangered	Houston, & Wabasha, MN Buffalo, LaCrosse, Trempealeau & Crawford, WI
Mudpuppy	none	none	endangered	Goodhue & Houston, MN Grant, WI Allamakee, IA
Northern cricket frog	endangered	endangered	none	Houston, MN Buffalo, Crawford, Grant, La Crosse, Trempealeau, & Vernon, WI
Ornate box turtle	none	endangered	endangered	Crawford & Grant, WI
Racer	special concern	none	none	Dakota, Goodhue, Houston, Wabasha, Washington, & Winona, MN Buffalo, La Crosse, Grant, & Vernon, WI
Rat snake	special concern	none	none	Houston & Winona, MN Crawford, Grant, & Vernon, WI
Slender glass lizard	none	endangered	endangered	La Crosse, WI
Smooth green snake	none	none	threatened	unknown
Timber rattlesnake	threatened	none	none	Dakota, Wabasha & Winona, MN
Western hognose snake	special concern	none	endangered	Dakota, Wabasha, & Winona, MN
Wood turtle	threatened	threatened	endangered	Goodhue, Ramsey, & Wabasha, MN

Table 4-7. State protected invertebrates of the navigable portions of the Upper Mississippi, St. Croix and Minnesota Rivers within the St. Paul District.

Species	Status Minnesota	Wisconsin	Iowa	Occurrence by County
Winged snaggletooth snail	none	threatened	none	Trempealeau, WI
Ottoe skipper butterfly	threatened	none	none	Wabasha, MN

Table 4-8. State protected plants of the navigable portions of the Upper Mississippi, St. Croix and Minnesota Rivers within the St. Paul District.

Species	Status Minnesota	Wisconsin	Iowa	Occurrence by County
Beach heather (povertygrass)	special concern	none	endangered	Wabasha, MN
Beaked (black) snakeroot	special concern	none	none	Winona, MN
Bladder pod	endangered	threatened	special concern	Goodhue, MN; Pierce, WI
Carolina anemone	none	endangered	none	La Crosse, Pepin, Pierce,& St. Croix , WI
Cattail sedge	special concern	none	none	Houston, Wabasha and Winona, MN
Catchfly grass	special concern	none	none	Houston, Wabasha & Winona, MN
Clasping milkweed	special concern	none	none	Houston, Wabasha, and Winona, MN
Cliff goldenrod	special concern	none	none	Houston, Wabasha & Winona, MN
Clustered broom-rape	special concern	threatened	endangered	Buffalo, WI
Davis' sedge	threatened	none	none	Houston & Wabasha, MN
Ebony spleenwort	special concern	none	none	Houston & Winona, MN
False mermaid	threatened	none	endangered	Winona, MN
Goat's-rue	special concern	none	none	Houston, Wabasha, & Winona, MN
Hairy meadow parsnip	none	endangered	none	Crawford, WI
Handsome sedge	endangered	none	none	Ramsey, MN
James' polanisia	endangered	none	none	Ramsey, MN
Kitten-tails	threatened	threatened	threatened	Pierce & St. Croix WI Dakota, Goodhue, & Washington, MN
Lance-leaved violet	threatened	none	special concern	Ramsey & Winona, MN
Marginal shield-fern	threatened	none	threatened	Houston, MN
Montia	endangered	none	none	Winona, MN
Narrow-leaved spleenwort	threatened	none	endangered	Winona, MN
Ovate-leaved skullcap	threatened	none	none	Goodhue, Houston, Wabasha & Winona, MN
Pale purple coneflower	none	threatened	none	Grant, WI
Plains wild indigo	special concern	none	none	Houston, Wabasha & Winona, MN
Plaintain leaved sedge	endangered	none	none	Winona, MN
Prairie indian plantain	none	endangered	none	Grant, WI
Prairie plum	none	endangered	none	Pierce & St. Croix, WI

Table 4-8. State protected plants of the navigable portions of the Upper Mississippi, St. Croix and Minnesota Rivers within the St. Paul District.

Species	Status Minnesota	Wisconsin	Iowa	Occurrence by County
Prairie thistle	none	threatened	none	Buffalo, Crawford, Grant, La Crosse, & Pierce, WI
Purple cliff-brake	special concern	none	endangered	Houston, MN
Purple milkweed	none	endangered	none	Crawford &Grant, WI
Purple rocket	endangered	none	none	Goodhue, MN
Purple sand-grass	special concern	none	none	Houston & Wabasha, MN
Raven's foot sedge	special concern	none	none	Goodhe & Wabasha, MN
Rhombic-petaled evening primrose	special concern	none	none	Wabasha, MN
Rock clubmoss	threatened	none	none	Houston & Winona, MN
Rough-seeded flameflower	endangered	none	endangered	Wabasha & Winona, MN
Sea-beach needlegrass	special concern	none	none	Wabasha, MN
Silver leaf grape	special concern	none	none	Winona, MN
Snowy campion	threatened	none	none	Winona, MN
Spreading sedge	threatened	none	none	Houston & Winona, MN
Squirrel corn	special concern	none	none	Houston & Winona, MN
Sweet-smelling indian-plantain	endangered	none	threatened	Houston & Wabasha, MN
Tubercled orchid	endanged	threatened	endangered	Ramsey, MN Buffalo & LaCrosse, WI
Upland boneset	threatened	none	none	Houston and Winona, MN
White lady's slipper	none	threatened	special concern	Buffalo, & Grant, WI
White wild indigo	special concern	none	none	Wabasha, MN
Wild petunia	none	endangered	none	Crawford, WI
Witch-hazel	special concern	none	none	Houston & Winona, MN
Yellow-fruited sedge	special concern	none	none	Wabasha, MN
Yellow gentian	none	threatened	none	Crawford & Grant, WI
Yellow giant hyssop	none	threatened	none	Crawford & Grant, WI

Many habitat types are used by the peregrine falcon including a wide variety of forest types, prairies, and highly urbanized areas.

The Higgins' Eye Mussel Recovery Plan (Stern et al. 1982) provides a description of the historic and present distribution of the Higgins' eye pearly mussel. Historically, the Higgins' eye pearly mussel was recorded throughout most of the UMR, ranging as far north as pool 3 and the Minnesota and St. Croix Rivers. The present distribution of the Higgins' eye pearly mussel within the District is limited to the St. Croix River and pools 7, 8, 9 and 10 (Stern et al. 1982; Havlik 1980; Duncan and Thiel 1983; Thiel 1981; Miller and Payne 1992). Five sites within the District have been identified as "essential" habitat by the Higgins' eye mussel recovery team (Stern et al. 1982): 1) St. Croix River opposite Hudson, Wisconsin (RM 17.6 - 16.2); 2) UMR at Whiskey Rock, opposite Ferryville, Wisconsin, Pool 9 (UMR 658.4 - 655.8); 3) UMR at Harpers Slough, Pool 10 (UMR 641.4 - 639.0); 4) UMR Main and East Channel at Prairie du Chien, Wisconsin, and Marquette, Iowa, Pool 10 (UMR 637.0 - 633.4); and 5) UMR at McMillan Island, Pool 10 (UMR 619.1 - 616.4).

The draft Winged Mapleleaf Mussel Recovery Plan provides a description of the historic and present distribution of the winged mapleleaf mussel. The present distribution of the winged mapleleaf mussel within the District is limited to a 12.5-mile stretch of the St. Croix River below Taylors Falls. This species is not known to occur within the lower 24.5 miles (9-foot channel area) of the St. Croix River nor anywhere else in the District.

4.1.11 Upper Mississippi River National Wildlife and Fish Refuge

The Upper Mississippi River National Wildlife and Fish Refuge (Refuge) was established by Act of Congress on June 7, 1924, to protect and preserve habitat needed by migratory birds, fish, and a variety of wildlife. It is a component of the National Wildlife Refuge System operated by the U.S. Fish and Wildlife Service, Department of the Interior.

The Refuge is the longest of the inland Federal refuges, extending 284 miles from Wabasha, Minnesota, to Rock Island, Illinois. Located within four States--Minnesota, Wisconsin, Iowa, and Illinois--the Refuge encompasses 194,000 acres of wooded islands, marshes, and open water. With the river bottoms, the Refuge ranges from 2 to 5 miles in width.

The Refuge supports a diversity of vegetative communities, with the majority being either forested or herbaceous wetlands. Stands of hardwoods and scattered prairie areas can also be found on the Refuge. Common tree species found on the Refuge include silver maple, cottonwood, river birch, willows, several species of oaks, and green and black ash. Common aquatic plants include arrowhead, water lily, bulrush, phragmites, American lotus, wild celery, and pondweeds.

The Refuge supports a wide variety of wildlife. Because of its geographic location and its north-south orientation, the Refuge provides valuable feeding and resting areas for migrating waterfowl. Diving ducks, such as canvasbacks, scaup, and ring-necked ducks, as well as tundra

swans frequent the larger open water areas. Species such as mallards and teal use the more marshy areas, while wood ducks use the smaller ponds and wooded areas. Many other migratory birds including herons, egrets, bitterns, rails, and various songbirds also use the area.

The USFWS has declared that a number of species warrant special attention including: canvasbacks, redheads, wood ducks, mallards, ring-necked ducks, black ducks, tundra swans, herons, egrets, bald eagles, and several others.

The Refuge also supports a diversity of game and non-game fish species.

Federally threatened or endangered species using the Refuge within the floodplain of the UMR include the bald eagle, peregrine falcon and Higgins' eye pearly mussel. In addition, many State-listed threatened or endangered species are known to occur on the Refuge.

4.1.12 Mississippi National River and Recreation Area (MNRRA)

The Mississippi National River and Recreation Area was established in recognition of the nationally significant historical, recreational, scenic, cultural, natural, economic and scientific resources located within the UMR corridor. The corridor runs from above the head of navigation to the Dakota/Goodhue county line, and contains numerous significant habitat areas as well as regional parks and trails, cultural/historic sites, scenic vistas and economically important business and industry.

4.1.13 Recreation Resources of UMR

The fish, wildlife, and other natural resources associated with the UMR offer a wide variety of water-based recreational opportunities. Ranging from wide expanses of open water conducive to sailing and waterskiing, to protected backwater areas for quiet fishing or contemplation, the UMR is a virtual sportsman's paradise. Additionally, the many sand beaches offer primitive camping and picnicking opportunities.

A number of public, private and commercial recreational developments provide access to the river. The scale of development ranges from full service parks, such as the District's Blackhawk Park in pool 9, to privately operated marinas, to primitive launching areas such as those provided by the USFWS. It is virtually impossible to maintain an accurate inventory of such facilities as picnic tables or boat slips available on the UMR because of the large number of providers.

Recreational beach sites are an important recreational resource on the river. These sites offer opportunities for swimming, sun bathing, camping and picnicking, and are used by a wide range of visitors. Use of these beaches ranges from casual stopping places for boaters to get out and stretch their legs, to destinations for overnight or longer term campers.

4.1.14 Archaeological and Historic Resources of UMR

4.1.14.1 Introduction

The UMR valley has been many things to those who have inhabited it. The river and its valley have been a transportation corridor; an economic resource for fish, game, mussels, and wild rice; a boundary between human groups; a recreational resource; and home to its inhabitants. During their travels on the river, in their camp sites and village sites and in the wrecks of their boats, the valley's inhabitants have left evidence of their presence. Dredging and dredged material disposal, navigation improvement works and beach nourishment activities have the potential to damage or destroy this evidence.

4.1.14.2 Archaeology

Rather than reviewing the culture history here, this discussion reviews what we have learned about how we have approached archeological resources in the UMR valley. For an extended discussion of the river's archeological culture history see Overstreet, et. al. 1996, *Cultural Resources Inventory of the Upper Mississippi River, St. Anthony Falls to Pool 10, Wisconsin, Iowa, and Minnesota* and the District's draft Historic Properties Management Plan.

In the broadest sense, human occupation of the UMR valley is a story of successful adaptation to environmental and social shifts over a 12,000-year period. The character of the valley has changed dramatically since the arrival of the first people some 12,000 years ago. From glacial fronts and torrential floods that have swept the valley, to a several-thousand-year drought in which the Mississippi River may have dwindled to little more than a stream, to the lush floodplain that we fish, hunt, and enjoy today, past cultures have occupied the banks of the river nearly continuously. Through these 12,000 years, the complexity of the cultures grew as population and technological innovations grew. Throughout its past, the river provided a centralizing focus for subsistence, travel, and the exchange of materials and ideas (Boszhardt and Theler *in press*).

Our knowledge of the prehistoric past along the UMR comes from archeological excavations beginning in the 1800's and continuing to the present day. Early investigations focused on areas adjacent to the floodplain, such as terraces and upland bluff tops. However, over the past decade, investigations along the river have increasingly shifted to include more study of the floodplain environment in an attempt to understand when and how prehistoric peoples were using it.

Much of the archeological survey that has been done on the UMR floodplain has been associated with Federal programs and projects. For the most part, surveys associated with Federal projects have been small in scale and oriented toward the specific project area in question. While these survey efforts have provided information on the presence and absence of resources that affect Federal projects, these surveys have not provided a comprehensive approach to resource management.

A more comprehensive approach to the study of cultural resources should be undertaken - one focusing on identifying appropriate methods and techniques for the study of floodplain environments, identifying specific geological patterns that influenced human settlement patterns, and identifying the full range of resources that may be present. This approach would allow for better management of the resources and, in the long run, would expedite the Federal compliance process for cultural resources related to small projects.

The standard survey methods and techniques used for upland environments are not necessarily those best suited to the floodplain. Over the past several years, chance encounters during floodplain surveys have located deeply buried sites in a number of locations along the river. If we are to fully appreciate how prehistoric populations were using the river over time, we cannot leave the location of some sites to survey techniques that provide only chance encounters while other sites are consistently located. Furthermore, before embarking on a floodplain survey, a better understanding of the morphology of floodplain environments is absolutely necessary. Unless this is accomplished prior to undertaking surveys on the floodplain, we can expect to continue surveying with inappropriate methods and in areas that may have little potential for furthering our understanding of the prehistory of the river.

Within the portion of the UMR that the District maintains, recent investigations have shown that, while some areas of the river have not changed significantly for thousands of years, other areas have changed radically. Geomorphological studies of some of the pools along the UMR suggest that major changes have taken place in river morphology that affect the potential for finding sites and, once found, the way in which these sites must be interpreted.

A comprehensive survey of pool 4 suggests that siltation of Lake Pepin over the past 1,500 years has reduced the size of the lake by nearly 5 miles. This information should have a dramatic effect on the way archaeologists look at this section of the river for planning and conducting future archeological surveys. This information also affects the archeological interpretations of sites previously found along the river in these areas. For example, archeological site 47PI95 was discovered in a 1988 survey of Pool 4 and was listed as being associated with a natural levee unit of the river. However, Dr. Clark Dobbs, in his final report of investigations, cautions

> ... we strongly suspect that further investigations at this site will reveal that it is actually within the remnant of a small delta or beach cusp that has been embedded in a more recent levee formation. The radiocarbon dates from near this site indicate that the Lake was at this point at least 800 years ago. At least some of the cultural materials recovered from the site are older than 800 years, suggesting that the site was used in association with activities oriented toward the lake, not the river.

Farther downstream in pool 7, a comprehensive survey failed to locate significant archeological resources associated with the floodplain of the UMR. The results of this survey were surprising, since the density of archeological sites on river terraces surrounding La Crosse is extremely high.

This phenomenon is likely associated with the large amount of post-settlement alluvium discharged into the UMR by the Black River. Boszhardt, in his 1988 survey of pool 7, states:

> The survey results posed a critical question: Do the lack of identified sites on Holocene landforms in Pool 7 reflect non-utilization by prehistoric and early historic groups, or do such sites exist but are simply not possible to locate given traditional floodplain shoreline survey methods? Based on the extensive prehistoric utilization of the Mississippi floodplain...it seems improbable that similar activities were not conducted in the upper reaches of Pool 7. To the contrary, it is highly likely that numerous sites do exist there.

From excavations of archeological sites on the terraces adjacent to the river, it is apparent the resources of the floodplain were being used much the same as other areas where floodplain sites are prevalent. Therefore, we must assume archeological sites once near the surface of the floodplain are now buried under an undetermined amount of alluvium.

Geomorphological studies have also shown that where we look for archeological sites has a direct bearing on the types and ages of the sites we find. Comprehensive surveys of pool 10 have identified an extremely large number of floodplain sites on the riverbanks; however, river morphology dictates the location of these sites. For example, sites have a much higher probability of being found along lateral accretion ridges than along mid-channel islands.

Many investigations of pool 10 have focused on the location of sites through shoreline survey and, interestingly, these shoreline surveys have identified a preponderance of late period sites. Clues of the existence of earlier floodplain sites have been found, but few actual early sites are known. Peter Church, in his study of the geomorphology of pool 10 (Church 1985) suggests that:

> Islands underlain by lateral accretion deposits have a high potential of containing archaeological sites. Prehistoric cultural material will be found in or beneath the vertical accretion deposits that mantle the lateral accretion deposits. Buried sandy ridges under the island interiors are older than those along the island perimeters and some may represent middle to possibly late Holocene landforms. (p. 235)

In 1988, Richard Wahls, a graduate student at the University of Wisconsin-Madison, confirmed Church's thesis that the island interiors may prove to be good locations for earlier sites, when he discovered the Tillmont archeological site. He describes this site as a large, well-stratified multi-component site located on a ridge in the center of an island. The Tillmont site dates from the Archaic through the Early, Middle, and Late Woodland periods, and also includes Mississippian and historic components.

In 1982 and again in 1996, the District conducted a literature search and records review of archeological and historic sites along the UMR. More than 1,000 known sites and districts have been identified along the river valley. These sites contained more than 1,400 archeological components dating from the earliest Paleo-Indian periods of 13,000 years ago to historic archeological sites associated with the early historic transportation of the mid-1800's.

The District has also placed more emphasis on identifying historic archeological sites along the river such as the Winter's Landing site in pool 7 and the structures associated with lumber booming along Beef Slough. The District is currently reviewing historic maps for data that will help identify these resources to insure future studies along the river take them into consideration.

Most recently, the District conducted a literature search and records review of historic shipwrecks known to have sunk in the UMR. Until passage of the Abandoned Shipwreck Act of 1987, these shipwrecks represented a category of resources that, for the most part, had been overlooked by both the State and Federal Government. This inventory effort identified over 60 wrecks along the UMR, St. Croix and Black Rivers. While much has been written about the riverboat era along the UMR, these resources have a great potential for providing specific information on the vessels themselves. At the present time, we know very little about construction methods and the history of construction development for the riverboats that plied the UMR.

Since the early days of Federal involvement on the UMR, the approach to archeology along the river has become increasingly more sophisticated. More resource types are being considered than ever before, survey methods and techniques are changing to meet the demands of varying conditions on the river, and archeological investigations are more consistently taking a multi-disciplinary approach to survey and evaluation of located resources. While archeology of the UMR has come a long way over the years, significant progress can still be made.

4.1.14.3 Historical Resources

4.1.14.3.1 Exploration and the Fur Trade

During the late 17th century, French explorers and fur traders became the first Europeans to enter the UMR valley. They initiated an era of tremendous change. The Dakota, Sac, Fox and other tribes living along the river had known of and met the French before, and they had been trapping furs and had been receiving trade goods for decades. But direct contact would bring rapid change. French entry into the Upper Midwest would lead to an ever increasing flow of Europeans and then Americans that would overwhelm the native populations. Written records from this era provide the great insights about Native Americans in this region and about what the region was like. But these records are scarce. Archeological sites dating from the era of exploration and trade can add immeasurably to our knowledge of this era. Great care should be taken to identify and preserve these sites, many of which lie in the floodplain or have been submerged by the 9-foot channel project. The history of this era can be divided into three distinct, if not entirely separate, periods: the French, British and American.

The French (1673-1763)

As far as we know, Jacques Marquette and Louis Joliet became the first Europeans to see the UMR. In 1673, they journeyed through Green Bay to the Fox River and then down the Wisconsin River to the UMR. They were followed, during the early winter of 1680, by Father Louis Hennepin, Michael Accault and Antoine Auguelle who traveled down the Illinois to the UMR and then upstream to what is now St. Paul and then by land to Mille Lacs Lake. Later in their journey, they would meet Daniel Greysolon, sieur Du Luth, who had come down from Lake Superior via the St. Croix. These men had come in part to survey the region and claim it for France, but also to begin direct trade with the Native Americans there.

To solidify both aims, the French began building trading posts and small forts throughout the UMR valley. They established three principal centers during the early 1700s: Lake Pepin, Prairie du Chien and Trempealeau. To trade with and attack the French, the Fox, Dakota and other tribes frequently visited these posts and forts. As many as 150 to 200 independent traders may have been in the upper river basin by the mid-18th century.

Between 1756 and 1763, the French and British fought over issues in Europe and the New World. Called the French and Indian War or the Seven Years War, it ended with Britain victorious. France had to cede its lands east of the Mississippi, except New Orleans, greatly diminishing France's territory in the Americas. (They had ceded their lands west of the river to Spain the year before.)

The British (1763-1815)

Trade and exploration remained strong with the British. After 1763, Prairie du Chien became even more important, as one of the few centers from which the British operated. While the British tried to convince the region's Indians to come to their main post at Mackinac, they failed. Competition from French and Spanish traders coming up from the south soon led the British to open the trade to independent English and Colonial traders who flooded the region. The American Revolution had little effect on the fur trade. Few war-related events occurred in the region, and the British would not withdraw until after the War of 1812. During this era, the number of traders working in the UMR valley increased greatly, as did the number of sites from which they traded.

The Americans (1783-1837)

British traders who remained in the UMR valley following the Revolutionary War concerned the Americans. British alliances with the region's Native Americans threatened the new country's hold on its western frontier. But it was not until Zebulon Pike's expedition to the upper river in 1805 and 1806 that the Americans began formal efforts to control the British. Pike's expedition, as those of Stephen Long in 1817 and of Lewis Cass and Henry Schoolcraft in 1820, were undertaken to assess the status of the region's Indian tribes and natural resources.

To ensure the safety of those traders and other American citizens already on the frontier and to pave the way for more settlement, the Americans began building more substantial forts in the west. Built at the confluence of the Mississippi and Minnesota Rivers, Fort Snelling, begun in 1819, would become the most substantial of these.

By 1840, the nature of the fur trade was changing. In 1837, key lands along the Mississippi's east bank had opened for settlement. The settlers quickly decimated the surviving fur bearers. By this date, settlers far outnumbered fur traders and would soon surpass the Native populations, and the wilderness of the UMR valley quickly came under the ax and the plow.

Cultural Resources Potential - The era of exploration and trade represents a critical time in Native American and American history. During this era, Europeans established their foothold in the UMR valley and Native American populations were forced to adapt to the great influx of Europeans and Americans, with their new cultures, new technologies and new diseases.

Fur traders did not come alone to the UMR valley. As the trade expanded, more bookkeepers, servants, hunters and clerks joined the fur traders. Trading posts and regular rendezvous sites began to grow into small villages. Many of these incipient villages were located in the floodplain.

Traders and explorers and those that followed them left forts, trading posts and associated buildings, portage routes, battle sites, rendezvous sites, historic Indian villages, camps and burial grounds, warehouses, agency buildings, and early settlements.

4.1.14.3.2 Transportation and Settlement

Until the 1860s, no transportation route provided better access to the Midwest than the UMR. Explorers and fur traders relied on it from the late 17th century to the mid-19th century. Between 1840 and 1880, steamboat traffic grew at the same frantic pace as did the population and production of the Upper Midwest. Immigrants, farmers and lumbermen depended on the river to transport themselves and their products, and commerce on the upper river flourished. By the late 19th century, traffic on the river began to decline and, except for local shipping, almost disappeared by 1920. Since the Corps of Engineers completed the 9-foot channel project, commerce has returned to the upper river on a far greater scale than ever before.

As the fur trade attracted the earliest settlers to the UMR valley, the region's other resources--its land, minerals, and timber--lured even more. Responding to the great inflow of immigrants, the Midwest's population soared between 1850 and 1900. Iowa's population grew from 192,000 to 2.2 million, Minnesota's population increased from 6,077 to 1.8 million, and Wisconsin's population swelled from 305,391 to 2.1 million. Overall, the Midwest's population grew from 5.4 million in 1850 to 26.3 million in 1900 (Dodd and Dodd 1973; Hartsough 1934; Merritt 1980). Many of these inhabitants lived along the upper river, especially in Minnesota and Iowa.

Early Riverboats. Prior to 1840, those traveling in the UMR Valley relied on several different types of boats. Explorers and early traders used birch bark and dugout canoes. As the fur trade grew and the need to deliver larger quantities of goods to the region increased, boats expanded in size and capacity. From the canoe, traders moved to the pirogue, a large dugout canoe, or to the bateau, which was wider than the pirogue and tapered at the ends.

Later, shippers developed the keelboat. Entrepreneurs on the UMR began using keelboats in the early 1800s. Built on a keel, with ribs and planking, some keelboats measured 40 to 80 feet long and 7 to 10 feet wide. The principal craft for hauling large loads upstream, keelboats had drafts of only 20 to 30 inches when loaded. Keelboats carried passengers, trade goods for the fur traders, and military supplies for posts such as Fort Snelling. Cargoes might include furs, grain, powder, alcohol, fabrics, metal goods, and numerous other commodities (Hartsough 1934; Haites, Mak and Walton 1975).

Settlers and fur traders also used flatboats. Simpler in design and cheaper to build than keelboats, flatboats were employed primarily for moving passengers and goods downstream (for this reason they were far more important on the Ohio River than on the Upper Mississippi). Ranging from 20 to 150 feet long and 12 to 20 feet wide, these boats carried 30 to 40 tons of goods. By the mid-1840s, steamboats had driven keelboats and flatboats from the upper river (Hartsough 1934; Haites, Mak and Walton 1975).

Cultural Resources Potential - As the great majority of the UMR valley's population and economic growth occurred after the 1840s, we would not expect to find many wrecks of the boats of early settlers, explorers and traders. Nor is there much evidence regarding the location and dates of the demise of such boats. As they had shallow drafts, they could have used the main channel or side channels in the river. Since few of these vessels may exist, those that are found would be of great historical value.

The Steamboat Era. Paddling upstream from St. Louis to St. Paul in 1823, the *Virginia* became the first steamboat to navigate the UMR. Steamboat traffic grew slowly over the next two decades. In 1841, 44 steamboat arrivals were recorded in St. Paul, and in 1849, 95 steamboat landings were counted there. During the 1850s, however, traffic boomed. In 1857 and 1858, St. Paul became a bustling port, with over 1,000 steamboat arrivals each year. Winona, Minnesota, 113 river miles downstream, was even busier, counting 1,700 steamboat dockings in 1857. The railroads that had reached the east bank of the upper river before the Civil War fed goods and passengers to the steamboat trade, further invigorating it (Hartsough 1934; Dixon 1909).

Passenger traffic on the UMR began with the *Virginia's* arrival in 1823 and grew slowly until the 1840s. With Iowa's statehood in 1846 and Wisconsin's in 1848 and the creation of the Minnesota territory in 1849, immigrants began streaming into the Upper Midwest. And while some immigrants reached the Midwest by way of the Great Lakes, many settlers entering Wisconsin, Iowa and Minnesota made part of their journey on the upper river (Tweet 1983; Peterson 1930). By the 1850s, passenger traffic became so important to the steamboat trade that passenger receipts often exceeded freight receipts (Peterson 1930).

Railroads, reaching the east bank of the Mississippi River in the mid to late 1850s, promoted passenger traffic. In 1854, the Chicago and Rock Island Railroad became the first railroad to reach the Mississippi River, when it entered Rock Island, Illinois, and that same year, the Chicago and Alton connected with the upper river at Alton, Illinois. In 1855, another railroad entered Alton and one reached Galena, Illinois. Quincy and Cairo, Illinois, became railheads in 1856, and East St. Louis, Illinois, and Prairie du Chien, Wisconsin, in 1857. La Crosse, Wisconsin, joined these cities, becoming the terminus of the Milwaukee and La Crosse in 1858. In 1856, the Chicago and Rock Island became the first railroad to cross the Mississippi (Dixon 1909).

Agricultural production boomed with the Midwest's population. In 1850, Iowa, Minnesota and Nebraska produced 11.8 million bushels of wheat, corn, oats and soybeans. In 1860, these crops totaled 65.8 million bushels, and by 1870 they accounted for 162 million bushels (Dodd and Dodd, 1973). By 1860, agricultural production had overwhelmed steamboat capacity. In the spring of 1860, the *Stillwater Messenger* estimated that farmers between St. Paul and La Crosse had stockpiled 200,000 bushels of grain for shipment on the river, and that by the beginning of the navigation season, they would have added another 150,000 bushels (Hartsough 1934). In response to this demand, steamboats began pushing barges during the 1860s and 1870s. One barge could carry as much as 10,000 bushels of grain and some steamboats pushed five barges. The St. Paul trade employed over 186 barges by 1866. While some barges moved grain to railheads for transshipment, others carried their cargoes to St. Louis and occasionally to New Orleans (Hartsough 1934). By the late 1860s, grain shipping, primarily wheat, ranked second to timber in downstream movement.

Steamboats began losing passengers and grain to railroads during and after the Civil War. Although early railheads on the upper river's east bank had fostered steamboat traffic, they had initiated its end as well. With each new rail connection, steamboats made shorter trips between ports. Instead of going to St. Louis or New Orleans, boats unloaded at La Crosse, Prairie du Chien, Rock Island or other railheads, making most river commerce local (Dixon 1909; Hartsough 1934). As railroads pushed lines across the Mississippi River, grain did not have to move to a river port before transshipment to a railhead. Between 1865 and 1869, three railroads crossed the river to Iowa: the North Western Railroad completed a bridge to Clinton in 1865; the Burlington Railroad finished one to Burlington in 1868; and the following year, the Illinois Central Railroad reached Dubuque. By 1880, 13 railroad bridges spanned the UMR, and most of the trans-Mississippi States north of St. Louis shipped their products to the East by rail (Dixon 1909). As railroads built lines paralleling some reaches of the river, steamboat traffic along those reaches quickly disappeared. By 1918, no packet boats or barges carried freight between St. Paul and St. Louis.

Cultural Resources Potential - Because cities along the river were so tied to it, they located their wharves, docks and many of their buildings on the waterfront and in the floodplain. Early photographs and maps clearly show this.

Given the number of steamboats that plied the UMR and the numerous hazards of steamboat navigation, the chances of finding steamboat wrecks are much higher than finding wrecks of earlier vessels. We have much more information about the location, date and cargoes carried on ships that sank in the upper river. Many of these wrecks may have survived dredging on the upper river because they are deeply buried or are in a side channel. We need to examine the historic record of steamboat wrecks carefully and compare it to the proposed and existing dredge cut sites. A recent study of shipwrecks indicates that 62 wrecks occurred in St. Paul District's portion of the river. (See John O. Jensen, "Gently Down the Stream: An Inquiry into the History of Transportation on the Northern Mississippi River and the Potential for Submerged Resources," Wisconsin Archeologist 73:1-2 (March-June, 1992):61-110.)

Although no work has been done in this area, railroad related cultural resources--the abutments of the earliest bridges, for example--should exist in the river valley.

Timber. Timber products dominated the upper river's commerce from the 1870s to the first decade of the 20th century. They comprised the greatest quantity of merchandise shipped on the river, and lumbermen shipped them farther and they accounted for more of the total value of goods moved on the river than other commodities. More than passenger traffic or grain hauling, timber shipping prompted Federal spending on river improvements for over 40 years. Lumbering had begun in Wisconsin and Minnesota in the 1830s and grew rapidly during the 1840s and 1850s (Hartsough 1934).

Raftboats guided log and lumber rafts that came from the Mississippi's Wisconsin tributaries and from above St. Anthony Falls to sawmills and retailing centers along the upper river from Minneapolis to St. Louis. These mills turned the logs and rough lumber into finished lumber, lath, and shingles that they shipped farther downriver or sent by rail to points east and west (Fries 1951; Blair 1930). Newly arrived immigrants and the rapidly growing domestic population used this lumber to build houses, farm buildings and business establishments throughout the Midwest. As railroads completed lines west of the Mississippi River, settlements spread deeper into the timberless plains, and the demand for lumber grew (Tweet 1983; Fries 1951).

Boom companies formed to sort and assemble logs floated into the Mississippi River from its tributaries. Mississippi River Commission maps from the late 19th century show booms located along many reaches of the upper river. The sorting and rafting works in the Beef Slough area at the mouth of the Chippewa River became one of the largest booming works in the world during the last part of the 19th century.

Timber shipping on the UMR lasted as long as the white pine forests of western Wisconsin and northern Minnesota. Initially, the St. Croix, Black and Chippewa Rivers of Wisconsin fed the largest quantities of logs and lumber into the UMR. While the Wisconsin River basin was estimated to hold 130 billion feet of pine in 1840, the largest reserve of timber rested in the Black and Chippewa River basins. One-sixth of the Nation's white pine west of the Appalachians stood in the Chippewa valley alone (Fries 1951; Merritt 1980; Tweet 1983). By 1892, however, the quantity of lumber expelled from Wisconsin's tributaries began to decline. From 718 million feet

of lumber milled along these tributaries in 1892, the amount produced fell to 465 million feet in 1900 and to 123 million feet in 1909. Masking this decline, mills in the Twin Cities and above began contributing more logs and lumber to the UMR. In 1888, these mills dispatched 27 rafts downstream (USACE 1889, 1890). By 1897, sawmills in Minneapolis and above produced more than those on the Mississippi's Wisconsin tributaries (USACE 1886-1897).

Overall, 1.6 to 2.1 billion feet of lumber moved into and on the UMR each year between 1892 and 1900. After turning out 2.0 billion feet in 1901, lumber milling along the river steadily declined. By 1909, mills on the river generated only 418 million feet of lumber (USACE 1892-1909).

Sawmills and raftboats fell with the forests of Minnesota and Wisconsin. At its peak, during the years 1893 and 1894, the lumber industry employed about 100 raft boats and 100 sawmills on the Mississippi River between Minneapolis and St. Louis (USACE 1894, 1895). The number of sawmills dropped to 80 by 1900, 36 by 1903, and one by 1913. Raftboats followed a similar decline. Of more than 100 raftboats plying the upper river in 1893, 86 remained on the river in 1900, 50 in 1904, 20 in 1906, and only four in 1912 (USACE 1892-1909). In 1915, the *Ottumwa Belle* guided the last lumber raft down the Mississippi from Hudson, Wisconsin, to Fort Madison, Iowa (Blair 1930; Tweet 1983).

Cultural Resources Potential - Given the intensity of lumber milling and shipping on the UMR, the potential for sites associated with the industry is considerable. Raft booming sites, including on-land and in-stream structures, logging camps, and floodplain sawmill sites may all be found in the river or its valley.

4.1.14.3.3 River Improvement

The UMR's landscape has changed dramatically since European explorers and traders first sailed on its waters. Most of the changes have come as a result of efforts to improve the river for navigation, but sedimentation, due to agriculture and clear-cutting, have contributed. Where cultural resources might lie or what condition they might be in may be determined by these factors.

Channel Constriction (1878-1930). Before the 1850s, the Corps of Engineers did little to eliminate natural obstacles to river transportation. Following the Civil War, however, the Corps began improving the Mississippi River for navigation through dredging, snagging and clearing, and channel constriction. The Engineers constricted the river with wing dams and the closing of side channels. Wing dams were long, narrow piers, composed of alternating layers of rock and bush, that extended into the river. Together with closing dams, they forced the river down a narrower passage, allowing it to cut through sand and debris in the main channel. The river then trapped the sediment behind or between the dams. The Engineers built experimental wing dams on the UMR in 1874 at Pig's Eye (later South St. Paul) and in 1875 and 1876 at Nininger Slough,

about 1 mile above Hastings, Minnesota. Based upon the success of these dams and pressure from waterway advocates, Congress authorized the four and one-half foot channel project on June 18, 1878, for the Mississippi River between St. Paul and the mouth of the Ohio River.

By the end of the 19th century, however, river boosters argued that if the Mississippi River was to offer a reliable navigation route or effective competition against railroads, it needed a deeper channel. With the timber industry faltering and other commodities not seeking waterway transportation, many river boosters blamed the decline of river traffic on the inadequacy of the 4½-foot channel (Tweet 1983). Responding to the Midwest's demand for help and to a railroad car shortage in 1906, Congress authorized the 6-foot channel project on March 2, 1907. This project called for more channel constriction and dredging and the construction of locks and dams at the Des Moines and Rock Island Rapids (Brunet 1977; U.S. Congress 1907).

Through channel constriction, the Corps changed the character of the UMR. The engineers made former side channels into the main channel, removed islands, isolated backwaters with closing dams, sloped and riprapped banks and began narrowing the river. By 1930, the Corps had built over 1,000 wing dams between the Twin Cities and Trempealeau, Wisconsin. In a 10-mile reach of the river above Winona, Minnesota, the St. Paul District had constructed almost 140 dams by 1930. The areas between the dams filled with sediment, and trees and plants soon began to grow from the dams and from the newly-formed land between them. By 1930, the river's banks had moved significantly inward.

Cultural Resources Potential - Channel constriction changed how the river was used and it changed where cultural resources lay. Some historic sites--such as shipwrecks--may have been buried in sediment. Wing dams collected massive amounts of sediment along the river's banks and the Engineers deliberately filled some backwaters and others filled in naturally due to closing dams. Other sites, those along the river's banks, may have been eroded away as wing dams directed the current toward them or they may have been buried by riprap when the Engineers protected the banks. Some of the earliest wing dams and closing dams should be considered eligible for the National Register.

Locks and Dams. Despite these improvements, commerce on the upper river declined steadily throughout the early 20th century. During this same period, the region's population and production increased dramatically. As the Midwest's need for a multi-faceted transportation system grew, its shipping options declined. By the mid-1920s, the region faced a transportation crisis. The crisis had been building for 40 years. Its origins lay in the UMR's failure to be a viable or competitive transportation route and in railroad expansion. Other factors contributed to the crisis as well. Railroad car shortages, the Panama Canal's opening and an Interstate Commerce Commission decision erected what Midwesterners called an "economic barrier" around their region.

In response to the transportation crisis, Midwesterners initiated a movement to restore commerce on the UMR. Led by the Minneapolis Real Estate Board, the movement began in Minneapolis, in 1925, and spread quickly to cities downriver. Between 1925 and 1928, river boosters,

including many of the Midwest's largest and most important businesses and agricultural organizations, struggled to restore commerce on the upper river.

They soon realized that they needed a channel deep enough to support modern tows and barges, a channel deep enough to enable the economies of scale necessary to compete with railroads. Such a channel would require harnessing one of America's greatest rivers with locks and dams. In 1928, river boosters turned their attention to achieving this goal. For 2 years, they fought to have the Corps of Engineers assess the project's feasibility and to get Congress to approve it. Despite President Hoover's opposition and Corps misgivings, deep-channel supporters convinced Congress to include their project in the 1930 Rivers and Harbors bill.

During the next 10 years, the Corps of Engineers constructed 23 locks and dams from just above Red Wing, Minnesota, to near St. Louis, Missouri. These locks and dams have fundamentally changed the character of the upper river. The dams have submerged many of the wing dams and closing dams, and they have inundated land that Indians, explorers, traders, settlers, and others formerly used for a variety of activities. To understand the potential for cultural resources in the river and its valley, we have to consider these changes.

The St. Paul District built three other locks and dams on the upper river before beginning the 9-foot channel project. The first, the Meeker Island Lock and Dam, was completed in 1907, but because of the development of hydroelectric power in the early 20th century, it was destroyed in 1912 to make way for a high dam. This high dam would be called Lock and Dam No. 1 or the Ford Dam. The Engineers completed this dam in 1917. The Corps built Lock and Dam No. 1 to bring traffic into Minneapolis. To get traffic above St. Anthony Falls, the Corps would complete Lower St. Anthony Falls Lock in 1956 and Upper St. Anthony Falls Lock in 1963. Because the river's slope above Hastings was so shallow, wing dams did not work well. Consequently, the Corps completed Lock and Dam No. 2 at Hastings in 1930. All these projects had been pushed for by Twin Cities navigation boosters.

Cultural Resources Potential - The reservoirs created by the river's dams have flooded many areas that had been seasonally dry, places that may have held cultural resources associated with one of the eras discussed above. They have also submerged most of the wing dams and closing dams and have changed the river's hydraulic regime. Sites that may have been seasonally inundated are now permanently under water. Other sites may be eroding due to wave action in the reservoir. Channel maintenance activities should consider the new relationship between the river and potential cultural resources sites.

Dam No. 1 and Locks and Dams 3 through 26 have been determined eligible for the National Register of Historic Places. Remains of the Meeker Island Lock and Dam are still visible in the river and should be considered eligible for the National Register. Upper and Lower St. Anthony Falls Locks and Dam lie in the St. Anthony Falls Historic District, one of the most important historic areas in the State.

4.1.14.3.4 Conservation and Historic Resources

National and regional "conservationists" began trying to improve the UMR for recreation and commerce soon after the Corps began its work. In 1871, Congress created the Office of the U.S. Commissioner of Fish and Fisheries (Bell 1936). While the river was not in danger, the commission and the commercial and sport anglers that it served wanted the UMR to yield more popular food and game species. So, beginning in 1872--6 years before Congress authorized the 4½-foot channel project--the commission introduced American shad into the UMR and 2 years later began stocking it with Atlantic salmon. While neither the shad nor the salmon survived long, the commission successfully introduced carp and stocked the river with native fish it thought desirable. It also established itself as another Federal agency with an interest in the river's management.

Fish management on the UMR expanded in 1874, when Iowa, Minnesota, Missouri, and Wisconsin established fish commissions. Iowa's commission, under its first commissioner, B.F. Shaw, began the most far-reaching program. At first, Shaw raised fingerlings for stocking use, but he soon turned to another source. Each spring, when the Mississippi flooded, fish entered the river's many backwaters to spawn. As the water receded, the adult fish returned to the river. Fingerlings--numbering in the hundreds of millions--remained and became stranded. Looking for a cheap source for stocking fish, Shaw recognized the trapped fingerlings as a tremendous resource. During the early 1870s, he began rescuing fingerlings from the backwaters and returning them to the river, and to the State's lakes and streams.

Other States and the Bureau of Fisheries soon followed Iowa's lead. But it was the Bureau that quickly dominated fish rescue on the upper river, establishing 34 fish rescue stations between 1917 and 1923. Fish rescue had become so vital to the Bureau's program by the early 1920s that its chief fish expert declared his agency dependent upon the Mississippi for its fingerling supply. In 1923, he reported, the Bureau provided 32 States with fish from the river. During the 1920s, the Bureau rescued 100 to 176 million fish annually.

For a more detailed history of the conservation movement on the UMR see Scarpino (1985) and Anfinson (1993) "Commerce and Conservation on the Upper Mississippi River."

Cultural Resources Potential - The 9-foot channel project, by flooding areas from which fingerlings had been rescued, forced the Bureau of Fisheries to change its fish management strategy. Instead of recovering stranded fingerlings, the Bureau had to build fish hatcheries and rearing ponds. Some of these it placed in the river valley. The remnants of ponds and other structures can still be found, and in some cases these features are historically significant (e.g., the Guttenberg Fish Ponds near Lock and Dam No. 10). Other physical structures or sites associated with other historic aspects of fish and wildlife management in the Mississippi River valley undoubtedly exist.

Button and Clamming Industries. In the 1890s, as the lumber industry waned, the clamming and button making industry began on the UMR. J.F. Boepple, a German immigrant, founded the

first button factory in 1891 in Muscatine, Iowa. By 1902, clammers had depleted the mussel beds in the Muscatine area. Clamming operations extended southward into Missouri and northward into Minnesota and Wisconsin. Productive mussel beds on the UMR included those at Guttenberg, McGregor, Lansing, Prairie du Chien, Lynxville, Prescott, and as far north as St. Paul.

As interest in clamming and the button industry spread, hundreds of clammers came to the river in scows during the catch season, harvesting several species of clams. Clam fishermen raised tent cities along the banks of the Mississippi during the summer months, particularly around Lansing, McGregor, Harper's Ferry, and Prairie du Chien. Although clammers employed several methods of gathering clams, they most often used crowfoot bars pulled by a small, flat-bottomed "john boat." During the winter months, when the ice on the river became thick enough, clammers harvested mussels through the ice with "shoulder" and "scissor" rakes.

Once clammers had raked the clams from the river bottom, they brought them to shore. They then boiled the harvest in crude, oblong tanks to separate the shell from the clam meat. They often sold the meat as bait or as feed for poultry and hogs. Clammers sold the shells to local factories or shipped the shells downriver for processing. In factories, workers cut the shells into button "blanks" and then drilled and polished them. Hundreds of women and men worked for button companies grading, cutting, and boxing shell buttons. Markets for the Mississippi shell buttons extended across the country.

Entrepreneurs built button factories and "saw works" in several river towns in the late 1890s and early 1900s. Prairie du Chien had the large Chalmers Button Factory, as well as several smaller operations. Lansing and Guttenberg had three button factories each. Downriver, Muscatine, Davenport, and Clinton also had factories.

Commercial clamming, button cutting, and the trading of pearls--sometimes found in the clams--were significant parts of the economy of the UMR for 30 years. During the 1930s and 1940s, however, inexpensive plastic buttons and the dwindling supply of mussels in the river destroyed the button industry.

Clamming revived on the UMR in the late 1960's. Japanese cultured pearl growers demanded freshwater clams as seed for their pearls. The Japanese processed the freshwater mussel shells into round pellets, which they inserted into saltwater oysters for producing pearls. Unlike previous clamming practices, clammers took only the larger shells of a few species, shipping thousands of tons of shells from Prairie du Chien to Japan. (Overstreet 1982, Scarpino 1985).

Cultural Resources Potential - Several historic clamming sites, shell heaps, and buildings related to the button industry are located along the UMR, particularly in the Prairie du Chien, McGregor, Guttenberg, and Lansing areas. The Red House landing site, located on the west side of the river near Marquette, is an important clamming station site that is being adversely affected by wave action and seasonal fluctuations in pool levels.

4.1.15 Socioeconomic Resources of UMR

The UMR System is an integral part of a broad regional, national, and international transportation network. As such, it has played a key role in the economic growth and development of the Upper Midwest including Minneapolis-St. Paul, the Quad Cities, Dubuque, St. Louis, Peoria, and Chicago. The river system provides an important link in the movement of goods both into and out of America's heartland.

Agricultural products, particularly grain, are the primary commodities moving out of the eight-State crop-growing region served by the rivers. The river system also provides a major artery for the transport of bulk commodities into the region for industrial production.

The river system is a vital source of water supply for domestic and manufacturing purposes. Recreation activities, waterfowl hunting, sport and commercial fishing, and commercial trapping are also valuable to local and regional economies.

Direct economic effects from commercial navigation include spending and employment generated by the commercial navigation industry, including wages, fuel, supplies, rents, and terminal expenses. Indirect economic effects include the inter-industry activities supported by the purchases of supplies, service, labor, and other inputs. Induced effects include economic activity that comes from household purchases of goods and services made possible because of the wages generated by the direct and indirect economic activities.

4.1.15.1 Population

As of 1980, the 18-county study area had a total population of 2,132,056. In 1984, the population had grown to 2,204,583, an increase of 3.4 percent. The population was 2,366,433 in 1990 and is projected to grow to 2,585,248 by 2000, an increase of 17.5 percent since 1980.

The county with the largest population in the study area, as of 1990, was Hennepin with a total of 1,032,431. Next in size was Ramsey with a total of 485,765. The county with the smallest population was Pepin with 7,107. Table 4-9 lists the 1980 and 1990 populations, percentage changes from 1980 to 1990, projections for the year 2000, and the square-mile area of the 18 counties in the study area.

Table 4-10 profiles urban and rural population for the study area. In 1980, 15 percent of the population lived in rural areas. By 1990, this figure had declined by 4.2 percent.

Table 4-9. Study area population.

County	State	1980	1990	Change (%)	2000 (proj.)	Area (sq. mi.)
Allamakee	IA	15,108	13,855	-9.0%	13,850	633
Clayton	IA	21,098	19,054	-10.7%	19,050	778
Dakota	MN	194,279	275,227	29.4%	347,220	574
Goodhue	MN	38,749	40,690	4.8%	41,480	763
Hennepin	MN	941,411	1,032,431	8.8%	1,110,300	541
Houston	MN	18,382	18,497	0.6%	18,560	564
Ramsey	MN	459,784	485,765	5.3%	512,240	154
Wabasha	MN	19,335	19,744	2.1%	20,040	537
Washington	MN	113,571	145,896	22.2%	172,110	390
Winona	MN	46,256	47,828	3.3%	48,070	630
Buffalo	WI	14,309	13,584	-5.3%	13,667	699
Crawford	WI	16,556	15,940	-3.9%	16,248	566
Grant	WI	51,736	49,264	-5.0%	51,162	1,144
LaCrosse	WI	91,056	97,904	7.0%	105,893	457
Pepin	WI	7,477	7,107	-5.2%	7,024	231
Pierce	WI	31,149	32,765	4.9%	35,862	576
Trempealeau	WI	26,158	25,263	-3.5%	26,061	736
Vernon	WI	25,642	25,617	-0.1%	26,411	808
Total		2,132,056	2,366,431	9.9%	2,585,248	10,781

Source: Bureau of the Census, 1980 and 1990; State Library of Iowa, Data Center; Minnesota Department of Planning, Demographic Office; and Wisconsin Department of Adminstration, Demographic Service Center.

Table 4-10. Urban vs. rural population for the study area.

Population	1980	1990	Change (%)
Urban	1,821,936	2,068,743	11.9%
Rural	310,120	297,688	-4.2%
Total	2,132,056	2,366,431	9.9%

Source: Bureau of the Census, Census of Population and Housing, 1980 and 1990.

4.1.15.2 Education

Minneapolis-St. Paul is the home of the University of Minnesota, Augsburg College, Concordia College, Hamline University, Macalester College, the University of St. Thomas, and William Mitchell College of Law. It is also the home of numerous community colleges, technical institutes, and seminaries. Winona is the home of Winona State University, St. Mary's, St. Teresa's College and a vocational-training school.

La Crosse has the UW-La Crosse and a Vocational and Adult Education Technical Institute.

UW-Platteville located in Grant County, Wisconsin, and UW-River Falls located in Pierce County, Wisconsin, are other universities found in the study area.

Table 4-11 shows the percentage graduating from high school for the study area. Dakota County (90.5 percent) and Washington County (90 percent) in Minnesota have the highest graduation rate in the study area, while Pepin County (70.9 percent) in Wisconsin had the lowest graduation rate. Comparable figures for the States of Minnesota, Iowa, and Wisconsin are as follows. According to data from the 1990 Census, the rate for persons 25 years old and over graduating from high school was 82.4 percent in Minnesota, 80.1 percent in Iowa; and 78.7 percent in Wisconsin.

4.1.15.3 Employment

Minneapolis-St. Paul is the corporate headquarters for several businesses listed among the 500 largest corporations in the Nation. Ranked on sales, each of the following businesses had over $1 billion in revenues in 1979. They are Minnesota Mining & Manufacturing, Honeywell, General Mills, Land O' Lakes, Control Data, and Pillsbury. Other major employers are U.S. West, Dayton Hudson Corporation, Northern States Power Company, Minneapolis Star & Tribune, Northwestern National Bank, and Prudential Insurance Company.

Major employers in the Winona area in 1979 along with the number of employees are as follows: Peerless Chain 555, Lake Center Industries 480, Fiberite Corporation 400, Winona Knitting Mills 350, and Watkins Products 300.

The largest employers in La Crosse in 1978 along with the number of employees are as follows: The Trane Co. 3,900, La Crosse Lutheran Hospital 1,300, St. Francis Hospital 1,200, University of Wisconsin-La Crosse 1,000, and G. Heileman Brewing Co. with 850.

In 1990, the size of the labor force was 1,322,175 for persons 16 years and older in the study area. Table 4-12 shows monthly labor force data for 1994 (monthly data for November and December were not available). These are the total values of the number of persons in the labor force, employment, and unemployment for the study area.

Table 4-11. Percent graduating from high school in the study area.

County	State	Graduating (%)
Allamakee	IA	76.5%
Clayton	IA	74.5%
Dakota	MN	90.5%
Goodhue	MN	78.0%
Hennepin	MN	88.1%
Houston	MN	76.0%
Ramsey	MN	85.0%
Wabasha	MN	76.5%
Washington	MN	90.0%
Winona	MN	77.8%
Buffalo	WI	72.6%
Crawford	WI	72.4%
Grant	WI	77.8%
LaCrosse	WI	82.5%
Pepin	WI	70.9%
Pierce	WI	81.0%
Trempealeau	WI	71.7%
Vernon	WI	69.1%

Source: Bureau of the Census, 1990.

Table 4-12. Study area labor force profile.

		Employment		Unemployment	
Date	Civilian Labor Force	Number	Rate (%)	Number	Rate (%)
Jan-94	1,414,620	1,358,299	96.02%	56,321	3.98%
Feb-94	1,437,705	1,383,084	96.20%	54,621	3.80%
Mar-94	1,426,355	1,372,487	96.22%	53,868	3.78%
Apr-94	1,440,726	1,391,064	96.55%	49,662	3.45%
May-94	1,450,374	1,411,251	97.30%	39,123	2.70%
Jun-94	1,461,728	1,410,361	96.49%	51,367	3.51%
Jul-94	1,449,800	1,407,005	97.05%	42,795	2.95%
Aug-94	1,449,359	1,404,414	96.90%	44,945	3.10%
Sep-94	1,430,251	1,381,708	96.61%	48,543	3.39%
Oct-94	1,457,081	1,414,336	97.07%	42,745	2.93%
Nov-94	NA	NA	NA	NA	NA
Dec-94	NA	NA	NA	NA	NA

Source: Bureau of Labor Statistics, Employment in State and Local Areas, 1994.

Comparable figures for the unemployment rate for Minnesota, Iowa, and Wisconsin are as follows. The 1994 annual unemployment rate was 3.8 percent in Minnesota, 3.7 percent in Iowa, and 4.7 percent in Wisconsin (Minnesota Department of Economic Security 1994; Iowa Department of Employment Services 1994; and Wisconsin Department of Labor, Industry, and Human Relations 1994).

4.1.15.4 Income

Per capita income is an approximate measure of the income available for consumption at any one time. Table 4-13 shows the per capita income, average household income, average household wealth (1989 and 1994 data only) for the study area in 1969, 1979, 1989 and a projection for 1994.

Comparable figures from Iowa, Minnesota, and Wisconsin are as follows. According to the 1990 Census, the per capita income in 1989 was $14,389 in Minnesota, $12,422 in Iowa, and $13,276 in Wisconsin. In 1989, the average household income was $37,718 in Minnesota, $31,874 in Iowa, and $35,180 in Wisconsin. Average household wealth is not a standard figure calculated by the Bureau of the Census.

4.1.15.5 Industries-Wholesale Trade, Retail Trade, and Services

Wholesale trade, retail trade, and services are the primary industries in the study area. Table 4-14 shows the volume of sales, number of employees, annual payroll, and number of establishments for the wholesale, retail, and service industries in the study area.

4.1.15.6 Agriculture

In 1982, 76.4 percent of the total land area was farmed. The number of farms decreased by 14.7 percent from 1982 to 1992. The average farm size remained the same but the amount of land devoted to farming declined 6.4 percent during this time period. Table 4-15 summarizes the number of farms, land in farms, average farm size, land in farms according to use, and proportion of land used for farming in 1982 and 1992.

4.1.15.7 Waterborne Commerce

4.1.15.7.1 Historic Trends

Between 1975 and 1995, waterborne commerce on the UMR between the mouth of the Missouri River and the head of navigation at Minneapolis grew from 63.2 million tons to 84.4 million tons. Year-to-year fluctuations have been significant due to changing market conditions and channel navigability. Traffic peaks occurred in 1983 (84.1 million tons) and 1990 (88.4 million tons); troughs occurred in 1986 (73.7 million tons) and 1993 (72.2 million tons). By way of historic comparison, traffic in 1970 was 53.8 million tons.

Table 4-13. Per capita income, average household income, and average household wealth in the study area.

Category	1969	1979	1989	1994 (proj.)
Per Capita Income	$3,441	$8,389	$12,430	$20,335
Average Household Income	$10,972	$22,632	$33,228	$49,527
Average Household Wealth	NA	NA	$118,064*	$145,577

* Average household income in 1989 is an estimated figure from the National Planning Data Corporation 1989 Update.

Source: National Planning Data Corporation 1989 Update - Population, Housing, and Wealth (1969, 1979, and 1994p data); and Bureau of the Census, 1990 (1989 data).

Table 4-14. Wholesale, retail, services industries in the study area.

Category	Wholesale	Retail	Services**	Total
Total Sales	58,697,045	21,524,819	14,465,011	94,686,875
# of Employees	89,627	297,810	255,392	642,829
Annual Payroll	3,036,552	2,519,853	5,932,701	11,489,106
Establishments	6,486	14,535	19,749	40,770

* Table values for wholesale, retail, and services are in thousands.
** Services data are for establishments with payroll only.

Source: Bureau of the Census, Censuses of Wholesale Trade, Retail Trade and Service Industries, 1992a.

Table 4-15. Study area farms, land in farms and land use: 1982 and 1992.

Category	1982	1992
Farms (number)	22,591	19,698
Land Farmed (acres)	5,271,422	4,846,204
Average Size of Farm (acres)	233	235
Approximate Total Land Area (acres)	6,900,674	6,884,272
Proportion of Farmed Land (%)	76.4%	70.4%

Source: Bureau of Census, Census of Agriculture, 1992b.

The primary commodities are farm products, coal, chemicals, and petroleum products. Other important categories include crude materials and primary manufactured goods. Traffic of farm products grew from 25 million tons in 1975 to 46.8 million tons in 1995 when it accounted for 55.5 percent of the tonnage on the UMR. Farm product traffic is sensitive to export demand. For example, when U.S. grain exports declined in 1985, traffic of farm products dropped to 29.4 million tons. Petroleum products have shown a long-term gradual decline from 11.9 million tons in 1975 to 7.0 million tons in 1995. Coal traffic grew in the early 1980's from 6.1 million tons in 1981 to 11.0 million tons in 1986 and since appears to have leveled off between 9.0 and 10.5 million tons. Since the mid-1980's, traffic of chemicals, including fertilizers, has also been fairly stable (7.9 million tons in 1984 to 7.7 million tons in 1995).

4.1.15.7.2 Projected Growth

The 1988 Inland Waterway Review projects waterborne commerce on the UMR to increase at an average annual rate of 1.7 to 3.1 percent through the year 2000. At this rate, unconstrained tonnage could increase from the 1986 level of 73.7 million tons to between 93.3 and 112.4 million tons by 2000. Farm products accounted for over half (53 percent) of the 1986 tons and are expected to be the driving force in future traffic growth as United States grain exports recover world market share. By the year 2000, farm movements are projected to be between 54.4 and 65.0 million tons. Coal traffic also is projected to grow at a moderate rate. Industrial and agricultural chemicals are forecasted to grow at a moderate rate as well.

4.1.16 Prairie Island Indian Reservation

The Prairie Island Indian Reservation is located on the Minnesota side of the river a short distance above lock and dam 3. In 1886, Congress authorized the purchase of land for the Sioux in Minnesota, including the Prairie Island Sioux. Until 1937, the Prairie Island Sioux had only 120 acres of land. In 1937, under the Indian Reorganization Act, Congress purchased an additional 414 acres and granted them use of some flowage land above lock and dam 3.

The Reservation is governed by a Tribal Council with one chairman and four council members, elected for 2-year terms. According to the U.S. Census, the number of people living on the Reservation was 80 in 1980. By 1990, the number of people living on the Reservation was 30, a decrease of 63 percent.

About one-half of the Reservation's land is currently situated in the floodplain. Much of the land is leased to tribal members for farming. The other major economic activity at the Prairie Island Reservation is a gaming facility. The Prairie Island Band operates the Treasure Island Casino.

4.2 ST. CROIX RIVER

4.2.1 General Setting of St. Croix River

The St. Croix River rises from St. Croix Lake in northwestern Wisconsin and flows approximately 164 miles to its confluence with the UMR at Prescott, Wisconsin. The lower 127 miles of the river forms the boundary between Wisconsin and Minnesota. The authorized 9-foot navigation channel extends up to river mile 24.5 and a 3-foot channel is authorized up to river mile 51.8, near Taylors Falls, Minnesota. A detailed description of the environmental setting of the St. Croix River is provided in (Colingsworth et al. 1973b).

4.2.2 Geology of St. Croix River

Similar to the UMR, the geologic characteristics of the St. Croix are largely a result of the most recent glaciation of the area. The lower 24.5 miles of the St. Croix River occupies a gorge cut down to 400 feet below the surrounding uplands. Between Taylors Falls and Stillwater, the river is a braided stream that occupies much of the floodplain. Below Stillwater, Lake St. Croix nearly fills the valley floor. The lake is formed by the bed of the UMR damming the mouth of the St. Croix River. Lake St. Croix ranges from 1 to 2 miles wide and is over 70 feet deep in locations. The St. Croix River watershed is underlain by a series of Precambrian and Cambrian igneous, metamorphic and sedimentary rocks (including basalt, sandstone, dolomite and shale) north of Taylors Falls, Minnesota (Colingsworth et al. 1973b). Downstream, the basin is underlain mainly by Cambrian and Ordovician sedimentary rocks (including sandstones, dolomite and shale).

4.2.3 Climate of St. Croix River

The climate of the lower 24.5 miles of the St. Croix River is similar to that of the UMR. Section 4.1.3 provides a description.

4.2.4 Soils of St. Croix River

The silt or sandy loam soils between Taylors Falls and Stillwater form a thin cover over bedrock. From south of Bayport to Afton, there are large, nearly level terraces composed of sand and gravel. There is very little alluvial land along this stretch of the river, but nearly level sand and gravel deltas and alluvial fans have formed at the mouth of almost every stream that flows into the river.

The soils along the Wisconsin bluff in Pierce County belong to the Dakota-Waukegan association, except those soils bordering the Kinnickinnic River valley. This latter group of soils belongs to the Antigo-Onamia association. Soils in both associations are moderately deep, loamy soils of stream terraces.

4.2.5 Watershed of St. Croix River

The St. Croix River has a drainage basin of about 7,650 square miles. The northern portion of the drainage basin is primarily forested while the southern portion is a farming area devoted mainly to dairy farming. The predominant land use in the basin is forest (about 60 percent), while cropland accounts for only about 20 percent of the land use.

4.2.6 Sedimentation on St. Croix River

Sedimentation historically has not been a problem on the St. Croix River. The forested regions that dominate the watershed of the St. Croix are relatively protected from soil erosion. Also, unlike the UMR, the bottom substrates of the St. Croix are gravel, boulder or bedrock, and are relatively impervious to erosion. However, occasional dredging is required to remove sediment deposited in the river at the mouth of the Kinnickinnic River, south of Afton, Minnesota.

4.2.7 Water Quality of St. Croix River

The water quality of the St. Croix River is generally high. Algae blooms in the lower reach of the river can result in water quality degradation; however, these events are infrequent. During the summer, phytoplankton populations, especially blue-green algae, may become quite abundant downstream of Hudson, Wisconsin.

The St. Croix River has calcium bicarbonate-type surface water, which reflects the composition of the groundwater discharge to the river (Hesse et al. 1993). Compared with other midwestern streams of comparable basin size, the St. Croix River has very low concentrations of suspended-sediment and total phosphorus.

Point sources of pollution along the lower portion of the river are primarily municipal wastewater treatment plants. Plants at Stillwater and Bayport, Minnesota, and Hudson, Wisconsin, discharge within the lower 24.5 miles of the river, with three plants located farther upstream. The plants at Bayport and Stillwater include phosphorus removal in their processing. Another point source, the King Power Plant in Oak Park Heights, Minnesota, discharges cooling water into the St. Croix. However, the Minnesota Pollution Control Agency (MPCA) has identified no waters within the St. Croix River basin that exhibit significant water quality violations (MPCA 1992).

Non-point sources of pollution include: road/ditch runoff; septic tank effluent, primarily north of the navigable portion of the river; and agricultural runoff, the primary source along the navigable portion of the river. Although fecal coliform levels occasionally have exceeded water quality standards, apparently due to agricultural runoff, water quality studies have found that dissolved oxygen, nitrogen, dissolved solids, turbidity, pH, and heavy metals remain at acceptable levels (GREAT 1980a). According to MPCA (1992), pesticide contamination of stream water and sediments is not a problem in the basin. However, in the mainstem of the lower St. Croix River, fish consumption advisories have been issued by the Minnesota Department of Health for several gamefish species.

In the St. Croix River area, the Prairie du Chien-Jordan aquifers supply groundwater from a regional recharge area located approximately between Forest Lake and Hastings, Minnesota. This groundwater is medium hard and contains more dissolved solids, sulfates and bicarbonates, but less iron and chloride than the softer water in the deeper Mount Simon-Hinckley aquifer. Alluvial sand and gravel deposits in stream valleys are important to private well owners, while on the uplands, glacial outwash and lenses of sand and gravel in the glacial till furnish water for a significant number of private, farm and some municipal wells. Hardness or softness and other chemical or mineral inclusions in the water are dependent on the specific aquifer being tapped (USACE 1974).

4.2.8 Aquatic, Wetland and Terrestrial Habitats of St. Croix River

4.2.8.1 Aquatic Habitats

The lower 24.5 miles of the St. Croix River is lake-like, with a fall, during low flow, of only about 0.3 foot. Water levels in this portion of the river are determined by regulation at lock and dam 3 on the UMR at Red Wing, Minnesota. Lake St. Croix has an average width of approximately 3,000 feet and a maximum width of about 7,500 feet. Bottom materials are primarily sand and gravel. As Table 4-1 illustrates, the entirety of open water habitat on the St. Croix is classified as lake/pond.

The sandy substrate and periodic scouring due to high water and floods have limited the amount of vegetation in the river channel. However, several species valuable to wildlife, wild celery and sago pondweed, are present. Arrowhead, cattails, burreed, rushes, sedges, coontail, duckweed, and a variety of pondweeds are present in backwater areas.

4.2.8.2 Wetlands

Floodplain development is very limited in the navigable portions of the St. Croix River. Wetlands occupy less than 5 percent of the total pool acreage of the St. Croix River valley. Those wetlands that are present are dominated by bottomland forest types which comprise approximately 93 percent of the wetland acreage present. The Willow and Kinnickinnic Rivers enter Lake St. Croix on the Wisconsin side. A shallow marsh wetland complex exists at the mouth of the Kinnickinnic.

4.2.8.3 Terrestrial Habitats

Land use in the lower portion of the St. Croix River basin is primarily residential. Developed areas along Lake St. Croix include Stillwater, Bayport, and a number of small communities on the Minnesota shoreline, and North Hudson, Hudson, and Prescott on the Wisconsin shoreline.

Steeper areas still support stands of white and red pine. Other areas support second growth pine intermingled with species such as silver and sugar maples, basswood, paper birch, aspen,

dogwood, ironwood, and elm. Understory species include dogwood, mountain maple, elderberry, and chokecherry. Red cedar can be found on some of the steeper grassy slopes.

4.2.9 Fish and Wildlife Resources of St. Croix River

4.2.9.1 Fish

The St. Croix River supports approximately 102 species of fish, the majority of which are also present in pool 3 of the UMR. Paddlefish and shovelnose sturgeon, although extremely rare, may also be present in the river.

4.2.9.2 Aquatic Invertebrates/Freshwater Mussels

Benthic organisms are abundant throughout the area. Chironomids are among the most abundant organisms in the backwater areas, with oligochast populations high in mid-channel areas.

Fuller (1980) reported 24 species of mussels present in the lower St. Croix River, including the Higgins' eye pearly mussel, a Federally listed endangered species. Thirty-one species of mussels were identified from a site near Hudson, Wisconsin in 1990 (Heath and Rasmussen 1990). One of the larger populations of Higgins' eye pearly mussels known to exist is located in the St. Croix River opposite Hudson, Wisconsin.

The winged mapleleaf mussel (*Quadrula fragosa*) is currently known to exist only in a stretch of the St. Croix River below Taylors Falls (Vaughn et al. 1993). This species, however, is not known to occur within the lower 24.5 miles (9-foot channel area) of the river.

4.2.9.3 Mammals

Common larger mammals inhabiting the area include white-tailed deer, muskrat, mink, raccoon, fox, skunk, and beaver. Shrews, moles, mice, bats, chipmunks, and squirrels are also common.

4.2.9.4 Birds

As with the UMR, numerous waterfowl use the St. Croix River during their spring and fall migrations. Some of the common dabbling ducks using the area include widgeon, mallard, wood duck, teal, pintail, gadwall, black duck, and shoveler ducks. Diving ducks include lesser scaup, ring-necked duck, goldeneye, canvasback, and redhead. Mallard, wood duck, and blue-winged teal are known to breed in the area. Canada geese use the area extensively throughout the year.

Some of the other species of birds common to the area include great blue and little green herons, Wilson's snipe, woodcock, pheasant, turkey, several species of sandpipers, gulls, terns, red-tailed and other broad-winged hawk species, falcons, ospreys, turkey vultures, ruffed grouse, mourning doves, cardinals, tanagers, grosbeaks, wrens, mockingbirds, thrushes, and a variety of other songbirds.

4.2.9.5 Reptiles and Amphibians

The area supports numerous reptiles and amphibians including various salamanders, toads, frogs, turtles, and snakes.

4.2.10 Federal Threatened and Endangered Species of St. Croix River

Species with Federal threatened or endangered status that use, or that might be found on, the lower St. Croix River include: the threatened bald eagle (*Haliaeetus leucocephalus*) which may nest, roost, and feed in the area; the endangered peregrine falcon (*Falco peregrinus*) which may also use the area for nesting, roosting, and feeding; the endangered Higgins' eye pearly mussel (*Lampsilis higginsi*); and the endangered winged mapleleaf mussels (*Quadrula fragosa*).

One of the larger known populations of Higgins' eye pearly mussels is located in the St. Croix River opposite Hudson, Wisconsin. The winged mapleleaf mussel is known to currently exist only in a stretch of the St. Croix River below Taylors Falls (Vaughn et al. 1993). This species, however, is not known to occur within the lower 24.5 miles (9-foot channel area) of the river.

Within the St. Croix River valley, bald eagle nesting territories have been identified near Stillwater, Bayport and Afton, Minnesota. Bald eagle use of the St. Croix River is limited for a number of reasons. The St. Croix valley is much narrower than the UMR and has very little backwater habitat. Recreational traffic is extremely high at times, which discourages bald eagle use. Open water areas on the St. Croix during the winter include the area below Taylors Falls, the narrows at Hudson, Wisconsin, the mouth of the Kinnikinnic River, and the confluence of the St. Croix-UMR at Prescott, Wisconsin. Eagle use of the St. Croix during winter is low and there are no known winter roost sites.

4.2.11 Recreation Resources

The portion of the St. Croix River that is part of the 9-Foot Navigation Channel Project, basically from Stillwater, Minnesota, to the confluence with the UMR at Prescott, Wisconsin, is also part of the Lower St. Croix National Scenic Riverway. The area is extremely popular with boaters, particularly powerboats and sailboats. There are two State parks, Afton State Park (MN) and Kinnickinnic State Park (WI), as well as a number of municipal parks offering access to the river. There a number of private marinas, particularly in the Stillwater-Bayport, MN area and at Hudson, WI. Popular beach areas are near Hudson, at Kinnickinnic State Park, and near Prescott. The river is often very crowded with boaters on summer weekends.

4.2.11.1 Lower St. Croix National Scenic Riverway

The portion of the St. Croix River that is part of the 9-Foot Channel Navigation Project, basically from Stillwater, MN, to the confluence with the UMR at Prescott, WI, is also part of the Lower St. Croix National Scenic Riverway. There are two State parks, Afton State Park (MN) and Kinnickinnic State Park (WI), as well as a number of municipal parks offering access to the river.

Popular beach areas are near Hudson, at Kinnickinnic State Park, and near Prescott. There are a number of private marinas, particularly in the Stillwater-Bayport, MN area and at Hudson, WI. The area is extremely popular with boaters, particularly large powerboats and sailboats. The river is often very crowded with boaters on summer weekends. River management is the responsibility of the States of Minnesota and Wisconsin. Because of the popularity of the river and the crowded conditions that exist most summer weekends, access to the river from either marinas or public launching areas is strictly controlled.

4.2.11.2 Kinnickinnic State Park

The park is located about 6.5 miles above the confluence with the UMR on the Wisconsin side. Very little development has occurred in the park. Recreational opportunities include picnicking, trails activities, and other dispersed activities. There is no vehicular access to the river. The most popular area of the park is the Kinnickinnic River delta, a large expanse of sand providing boat beaching opportunities. The beach has been nourished and expanded with dredged material in the past.

4.2.11.3 Afton State Park

Afton State Park is located on the Minnesota side of the St. Croix River about 9 miles above the confluence with the UMR. It has developed for low-level intensity/dispersed forms of recreational experiences, such as hiking and pack-in camping. It offers access to the river for swimming and fishing. The "focus" of the park is not on the river, but rather on the wooded, rolling terrain. The park is used year-round for trail-related activities, with cross-country skiing and hiking being very popular.

4.2.12 Archaeological and Historic Resources of St. Croix River

The District has done very little archeological survey in the portion of the lower St. Croix River valley that is affected by the Channel Maintenance Program. The National Park Service has conducted a number of seasons of field survey of the portion of the St. Croix River designated as a Scenic River. These reports identify a number of archeological sites located as a result of their efforts.

For a general discussion of the archeology, please see the UMR section of this report.

In general, the history of the lower St. Croix River is closely tied to that of the UMR. See discussion of the UMR in section 4.1.13.

4.2.13 Socioeconomic Resources of St. Croix River

The lower 25 miles of the St. Croix River remains relatively undeveloped considering the proximity to the Twin Cities metropolitan area. The Minnesota shoreline from approximately mile 11 to mile 25 is the most developed, containing the small communities of Afton, St. Mary's Point, Lake St. Croix Beach, Lakeland Shores, Lakeland, Bayport, Oak Park Heights, and the city of Stillwater. Most of the shoreline development associated with the first five communities is residential. In the Bayport-Oak Park Heights-Stillwater area, there is more commercial-industrial development, including the Northern States Power Co. Allen King generating station at river mile 21.

On the Wisconsin side of the river, most of the shoreline consists of undeveloped wooded bluffs. Prescott, Wisconsin, is located at the mouth of the river, and the communities of Hudson and North Hudson are located adjacent to the river at miles 16-17. Many residents of the St. Croix River valley in both Minnesota and Wisconsin commute to the Twin Cities for employment.

4.3 MINNESOTA RIVER

4.3.1 General Setting of Minnesota River

The Minnesota River has its origins in Big Stone Lake on the Minnesota-South Dakota border, and flows 333 miles to its confluence with the UMR in St. Paul, Minnesota. Average monthly flows at Jordan, Minnesota, range from a low of about 650 cubic feet per second (cfs) in January to a high of 10,750 cfs in April. July flows average about 4,250 cfs. The authorized 9-foot navigation channel extends up to river mile 14.7, and a 4-foot channel is authorized up to river mile 25.6. A more detailed description of the environmental setting of the Minnesota River can be found in Colingsworth et al. (1973a).

4.3.2 Geology of Minnesota River

Similar to the UMR, the geologic characteristics of the Minnesota River are largely a result of the most recent glaciation of the area (see Section 4.1.2). As glacial Lake Agassiz drained southeastward via the glacial River Warren, a broad, deep valley was scoured out. As River Warren ebbed, the deep valley filled with sediment, up to 80 feet deep at Mendota and 180 feet deep at South St. Paul. The broad glacial valley is presently occupied by the much smaller Minnesota River.

4.3.3 Climate of Minnesota River

The climate of the navigable portion (lower 25.6 miles) of the Minnesota River is similar to that of the UMR. The upper Minnesota River watershed varies from dry subhumid in the west to moist subhumid near the Twin Cities. The average temperature is about 46° F and the average total precipitation is about 27 inches. Average wind velocities range from 7 to 12 miles per hour.

4.3.4 Soils of Minnesota River

The soils on the bluff tops and terraces bordering the Minnesota River generally are coarse to medium on the left bank from the Red Rock-Staring Lakes area downstream to Fort Snelling and on the right bank terrace at Shakopee, from Savage to the I-35W Bridge, and from the Black Dog plant to Mendota. These soils are well-drained, acid and low in nitrate and phosphate. The percolation rate is generally less than 10 minutes per inch. Medium to moderate fine soils are found on the bluff top and slope upstream from the Red Rock-Staring Lakes area and along the bluff slope downstream from these lakes to Fort Snelling. On the right bank, these medium to moderately fine soils are found on the bluff top south of the terraces at Shakopee and along the bluff slope from Scott County Highway 25 to Savage. These rich clay soils have percolation rates 5 to 15 times slower than that of the sandy soils.

In the river valley, dark, organic river bottom soils are present. Seasonally inundated and poorly drained, these soils comprise 17,600 acres of floodplain found in the lower 30 miles of the

Minnesota River valley. Percolation is slow, ranging from virtually zero at saturation to as much as 5 inches per hour when the soils are dry or drained. The pH of these river bottom soils is acid where peat has accumulated, and alkaline in the mineral soils.

4.3.5 Watershed of Minnesota River

The Minnesota River drains approximately 16,900 square miles of primarily southwestern Minnesota. Much of the Minnesota River basin is intensively farmed with row crops, and sheet erosion from cropland is a major source of sediment in the river.

4.3.6 Sedimentation on Minnesota River

A large percentage of the Minnesota River basin is in agricultural use and supplies the river with a heavy sediment load. The Minnesota River is a major contributor of suspended sediment to the UMR.

4.3.7 Water Quality of Minnesota River

Water quality of the lower portion of the Minnesota River is similar to, but somewhat lower than, that of pool 2 of the UMR into which it flows. With its high conductivity levels, the Minnesota River contributes substantial amounts of dissolved solids to the UMR. Fecal coliform levels of the Minnesota River are also relatively high, most likely from point source inputs along the river and the drainage area's high agricultural use. Impurities and silt content are especially high from Shakopee, Minnesota, downstream to the mouth of the Minnesota River. The Minnesota River has a serious negative effect on water quality in the UMR. State and Federal water quality standards for turbidity, unionized ammonia and dissolved oxygen are frequently violated in the lower Minnesota River. These violations are probably due in large part to non-point pollution sources.

The many marshes, wetlands, and small shallow lakes between the river and the bluffs are spring fed. Although the water in many of these areas is turbid due to rough fish activity, the water is generally of considerably higher quality than that of the river.

Groundwater supplies in the Minnesota River drainage basin are derived from sand and gravel deposits in the glacial drift, stream alluvium and bedrock rock strata. Municipalities generally obtain their water from aquifers in the bedrock. Lenses or beds of sand and gravel in the glacial drift supply a large share of private and farm wells and some municipalities in the uplands. Alluvial sediments in stream valleys are a significant source of water for private and farm use. Compared with bedrock and glacial drift aquifers, the water from the alluvium is very hard and high in iron content (USACE 1974).

4.3.8 Aquatic, Wetland and Terrestrial Habitats of Minnesota River

4.3.8.1 Aquatic Habitats

The navigable portion of the Minnesota River extends upstream from its confluence with the UMR 25.6 miles to Shakopee, Minnesota. The water level in this reach of the river is approximately the same as pool 2 with water levels controlled by lock and dam 2 at Hastings, Minnesota.

A natural levee exists between the river and surrounding bluffs through much of its navigable reach, creating numerous areas of marsh, wetlands, and small shallow lakes. These areas are approximately 10 feet higher in elevation than the river, are spring fed, provide a high quality water source, and are productive and valuable areas for both vegetation and wildlife.

Main channel and lake/pond habitats comprise approximately 40 and 53 percent, respectively, of the open water aquatic habitat on the Minnesota River.

4.3.8.2 Wetlands

The lower 25 miles of the Minnesota River meanders through a floodplain bordered by low bluffs and terraces. The floodplain is 1 to 1½ miles wide in this area and dominated by marshes and bottomland forest, which in total occupy approximately 46 percent of the total pool acreage of the Minnesota River floodplain. Common bottomland forest tree species include cottonwood, elm, silver maple, oaks, willows, ash, basswood, box elder, and aspen. Common species in the marshes and wet meadows include bulrushes, reeds, bluestem, wild alder, and bog birch.

The Minnesota Valley National Wildlife Refuge encompasses much of the floodplain in this reach of the river (see Section 4.3.11).

4.3.8.3 Terrestrial Habitats

The uplands bordering the floodplain are steadily being developed as the Twin Cities metropolitan area continues to grow. Olson and Meyer (1976) estimated approximately 35 percent of the upland acreage in the Minnesota River valley was classified as disturbed terrestrial. The navigable portion of the Minnesota River is bordered by the cities of Shakopee, Eden Prairie, Savage, Bloomington, Burnsville, Eagan, Richfield, Mendota Heights, and St. Paul, Minnesota.

4.3.9 Fish and Wildlife Resources of Minnesota River

4.3.9.1 Fish

The Minnesota River supports approximately 90 species of fish. With the exception of the goldeye, all are present in pool 2 of the UMR.

4.3.9.2 Aquatic Invertebrates/Freshwater Mussels

Fuller (1978, 1980) reported that mussels were probably extinct in the navigable portion of the lower Minnesota River. He cited heavy organic enrichment due to agricultural practices in the watershed, along with pesticide and herbicide runoff, as the primary cause for extirpation. However, according to the Minnesota Department of Natural Resources, recent mussel surveys have reported positive finds of freshwater mussels in the Minnesota River. Water quality and habitat conditions have apparently improved since the Fuller surveys, triggering a return of freshwater mussels to the lower Minnesota River.

The invertebrate assemblage found in the navigable portions of the river is simplified compared to that of the UMR. Oligochaetes (primarily sludgeworms) and chironomids dominate the bottom invertebrate fauna.

4.3.9.3 Mammals

Some of the common mammals using the area include white-tailed deer, red fox, cottontail rabbit, beaver, raccoon, and squirrels.

4.3.9.4 Birds

The lower portion of the Minnesota River is used by numerous waterfowl, shorebirds, and songbirds. Some of the more common waterfowl include mallard, blue- and green-winged teal, ring-necked duck, wood duck, and Canada goose.

4.3.9.5 Reptiles and Amphibians

The area supports numerous reptiles and amphibians including various salamanders, toads, frogs, turtles, and snakes.

4.3.10 Federal Threatened and Endangered Species of Minnesota River

Species with Federal threatened or endangered status that use, or that might be found on, the lower portion of the Minnesota River include: the threatened bald eagle (*Haliaeetus leucocephalus*) which may nest, roost, and feed in the area and the endangered peregrine falcon (*Falco peregrinus*) which may also use the area for nesting, roosting, and feeding.

Because of the river valley's intense urbanization, bald eagle use of the Minnesota River valley is very limited. There has been one recorded nest from the lower Minnesota River near Long Meadow Lake. There are no known roosting sites, and winter use of the area is limited.

4.3.11 Minnesota Valley National Wildlife Refuge

The Minnesota Valley National Wildlife Refuge was established in October 1976 with passage of Public Law 94-466. The refuge is located along a 32-mile stretch of the Minnesota River between Fort Snelling and Jordan, Minnesota. It currently encompasses approximately 7,100 acres, with 12,400 acres authorized. The refuge is comprised of seven separate management units, four of which have been provided with trails and interpretive facilities.

The refuge is a greenbelt along the Minnesota River bordered by industrial, business, residential, and agricultural areas. It includes river bluff, floodplain forest, native prairie, savanna, and a wide variety of wetland habitats.

Upland forested areas include trees such as oak, elm, and maple with an understory of dogwood, chokecherry, and other shrubs. Floodplain forests contain tree species such as cottonwood, willow, silver maple, and elm; shrubs such as dogwood, willows, and alders; and numerous other understory species including nettles and wild grape.

Native prairie grasses include switchgrass, big bluestem, little bluestem, and Indian grass. Shrubs bordering these grasslands include species such as sumac, hazel, and prickly ash.

Common species in the refuge's wetlands include cattails, bulrush, and reed canary grass. Water lily, duckweeds, and a variety of pondweeds are common in open water areas.

Over 250 species of birds are known to use the refuge during at least some part of the year, with about 150 of these species using nesting habitat within the Minnesota River valley. In addition to a wide variety of woodland species, the refuge provides nesting habitat for a variety of waterfowl including mallards, wood ducks, blue-winged teal, goldeneye, mergansers, and Canada geese. The refuge also contains a great blue heron rookery.

At least 50 species of mammals including beaver, muskrat, and white-tailed deer use the refuge, along with about 30 species of reptiles and amphibians.

Federally listed threatened or endangered species that could use habitats within the refuge include the bald eagle and peregrine falcon.

4.3.12 Recreation Resources

That portion of the Minnesota River within the 9-Foot Navigation Channel Project is typically narrow and winding. There are very few opportunities for boat beaching. Much of the riparian lands along this stretch are within either Fort Snelling State Park or the Minnesota Valley National Wildlife Refuge. The typical recreational activities occurring in this area are fishing and boating. Most of the developed recreational opportunities are located within Fort Snelling State Park. An old cutoff channel offers access to picnicking and swimming facilities.

Fort Snelling State Park is located at the confluence of the Minnesota and UMR, and extends several miles up the Minnesota. Most of the park lies within the floodplain of the river. Recreational opportunities offered in the park include picnicking, trails, swimming in Snelling Lake, a spring-fed backwater lake, boat launching and wildlife observation. The park preserves large expanses of a variety of wetland types that can be viewed from a number of vantage points, including two bridges crossing the park, and from commercial airliners on take-off/landing at the adjoining Minneapolis-St. Paul International Airport.

4.3.13 Archaeological and Historic Resources of Minnesota River

The District has done very little archeological survey in the portion of the lower Minnesota River valley that is affected by the Channel Maintenance Program. The U.S. Fish and Wildlife Service has conducted archeological and historic surveys of the Minnesota Valley National Wildlife Refuge that have identified a number of archeological sites.

For a general discussion of archeology, see the UMR section of this report.

In general, the history of the lower Minnesota River is closely tied to that of the UMR. See discussion of the UMR in section 4.1.13. For a more detailed and specific account of the Minnesota River see Roberts and Dobbs (1993) "A Lower Minnesota River Valley Cultural Resource Study and Interpretive Plan for the Minnesota Valley State Park & Trail."

4.3.14 Socioeconomic Resources of Minnesota River

The lower 14 miles of the Minnesota River valley lies within the Twin Cities metropolitan area. In this 14-mile reach, the river flows through or abuts the cities of Mendota Heights, Eagan, Bloomington, Burnsville, Savage, and the Minneapolis-St. Paul International Airport. However, in this area the river has a largely undeveloped 1- to 2-mile floodplain, and commercial-industrial development adjacent to the river is uncommon. The only development close to the river is the Northern States Power Co. Blackdog generating station at river mile 10.7 and a series of grain and petroleum terminals in Savage on the right bank of the river at river mile 12.7 to 14.7.

5.0 ENVIRONMENTAL EFFECTS

As discussed in Section 3.0, the no action alternative or "without plan condition" is the recommended plan of the GREAT I study. The rationale for selecting the GREAT I plan as the "without plan condition" is that it contains the last approved Federal-State plan of action for maintenance of the 9-foot navigation channel. The St. Paul District has been implementing the GREAT I plan since 1981. A final Environmental Impact Statement (EIS) was prepared and completed for the GREAT I study. As a result, the impacts of the GREAT I recommendations that have been followed in development of the CMMP have already been addressed in the GREAT I EIS. The proposed CMMP plan for dredging, dredged material placement, channel structures, recreational beach development and snag removal is in essence implementation of the GREAT I recommendations. The CMMP represents a proposal by the District that differs from the GREAT I recommended plan, primarily in the implementation of long-term dredged material placement sites. In this regard, the GREAT I plan provides a relevant "measuring stick" to compare with the alternatives being addressed in this final EIS.

The environmental effects of the actions and alternatives proposed in the CMMP are discussed below.

5.1 EFFECTS OF DREDGING AND DREDGED MATERIAL PLACEMENT

The general effects of dredging and dredged material placement would be realized wherever maintenance dredging activities are conducted. These effects would occur and are generally consistent across alternative plans. As a result, the primary delineation or comparison of impacts between alternative plans arises from differences between the number of active dredge cuts and selected disposal sites.

The post-GREAT I planning effort for dredged material placement identified approximately 120 different placement sites and resulted in the development of approximately 95 alternative placement plans for individual pools or reaches. The CMMP is the culmination of this planning effort. The dredge cuts to be maintained under both the GREAT I and CMMP are listed in Table A-1 of Appendix A. Placement site planning was completed for 112 dredge cuts under GREAT I. Site planning was completed for 85 main channel dredge cuts and 11 commercial and small-boat harbors under the CMMP. The selected disposal sites for the CMMP and the GREAT I plan are listed in Tables 5-1 and 5-2, respectively.

5.1.1 Effects of Dredging and Dredged Material Placement on Water Quality

Dredging primarily affects the main channel of the river. However, it can also affect side channels, sloughs and backwater lakes and ponds through increased turbidity and suspended solids concentrations and resuspension of pollutants.

Table 5-1. Dredged material placement sites for the GREAT I original plan.

Location	GREAT Site #	Site Name	Habitats Affected Under GREAT I Plan (acres)(1)									Dredge Cuts	Quantity Placed (c.y.)	Beneficial Use (c.y.)	Quantity Left (c.y.)
			OW	T345	T12	RB	OD	UF	AF	DT	AQ				
MN-13.5-RMP	MN.03	Cargill			7.0							MN-4&5	137,000	37,000	100,000
MN-11.4-RMP	MN.30		32.5								32.5	MN-3	387,500	0	387,500
MN-4.5-RMP	MN.28									18.0		MN-2	80,000	80,000	0
			32.5	0.0	7.0	0.0	0.0	0.0	0.0	18.0	32.5		604,500	117,000	487,500
SC-22.0-RMP	SC.24				16.0							SC-3	534,000	0	534,000
SC-18.2-RMP	SC.18		4.0			2.0						SC-3	45,000	0	45,000
SC-17.5-LWP	SC.28	Above Hudson RR Bridge				4.0						SC-3	20,000	0	20,000
SC-17.0-LWP	SC.22	Hudson	1.5							1.5		SC-3	75,000	0	75,000
SC-16.6-LWP	SC.01	Beer Can Island	7.0									SC-3	20,000	0	20,000
SC-16.9 to 17.4-LWP	SC.3-6	Beer Can Island				7.0						SC-3	20,000	0	20,000
SC-13.5-RMP	SC.21					5.0						SC-2	44,000	0	44,000
SC-8.5-RMP	SC.27				2.0							SC-3	50,000	0	50,000
SC-6.7-LWP	SC.13	Kinnickinnic Bar Upper				9.0						SC-1	75,000	0	75,000
SC-6.5-LWP	SC.12	Kinnickinnic Bar Lower				17.0						SC-1	139,900	0	139,900
SC-0.5-RMP	SC.16	Pt. Douglas Nearshore	2.5									SC-1	65,000	0	65,000
SC-0.2-RMP	SC.26	Pt. Douglas Beach	2.5			2.5						SC-1	60,000	0	60,000
			17.5	0.0	18.0	46.5	0.0	0.0	0.0	1.5	0.0		1,147,900		1,147,900
U-857.1-RMP	U.02									3.0		USAF-1, 2&3	1,000,000	1,000,000	0
U-854.7-LMP	U.03									7.0		USAF-1, 2&3	505,000	505,000	0
			0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0		1,505,000	1,505,000	0
1-853.1-RMP	1.01									3.5		All cuts in Pool 1	3,034,000	3,034,000	0
1-851.3-LME	1.07T	Below Franklin Avenue				11.5						1-5	Emergency	N/A	0
1-849.5-RME	1.03T	Below Lake Street				6.0						1-3&4	Emergency	N/A	0
1-848.5-LME	1.02T					4.5						1-1	Emergency	N/A	0
			0.0	0.0	0.0	22.0	0.0	0.0	0.0	3.5	0.0		3,034,000	3,034,000	0
2-843.3-RMP	2.18	see footnote 2										2-10; MN-1	177,500	177,500	0
2-841.3-LMP	2.37									7.0		2-9	365,500	200,000	165,500
2-840.4-RMP	2.16	Highbridge								3.4		2-8	199,000	199,000	0
2-838.2-RMP	2.15	Northport								5.5		2-7	261,000	0	261,000
2-837.5-RMP	2.40	St. Paul Barge Terminal	28.0									2-7	1,828,000	495,000	1,333,000
2-836.8-RMP	2.14	Holman Field (3)										2-7	608,000	0	608,000
2-836.3-RMP	2.13	Southport			18.0							2-7	200,000	0	200,000
2-832.5-RMP	2.10									25.0		2-4, 5&6	755,000	755,000	0
2-820.0-LMP	2.35									25.0		2-2&3	696,000	240,000	456,000
2-815.4-RMP	2.30				3.5							2-1	41,500	41,500	0
			28.0	0.0	21.5	0.0	0.0	0.0	0.0	65.9	0.0		5,131,500	2,108,000	3,023,500

Table 5-1. Dredged material placement sites for the GREAT I original plan.

Location	GREAT Site #	Site Name	Habitats Affected Under GREAT I Plan (acres)(1) OW	T345	T12	RB	OD	UF	AF	DT	AQ	Dredge Cuts	Quantity Placed (c.y.)	Beneficial Use (c.y.)	Quantity Left (c.y.)
3-814.5-LMP	3.42		4.5		4.0							3-9	51,500	0	51,500
3-814.3-RMP	3.47-8					1.5				1.5		3-9	10,000	0	10,000
3-813.2-RMP	3.46	Hastings Harbor							11.0			3-4, 5, 6, 7&8	411,000	411,000	0
3-811.5-LMP	3.34	Point Douglas		4.0				6.0				SC-1; 3-7	322,000	240,000	82,000
3-808.4-LWP	3.27	Dry Run Slough			31.0							3-4, 5&6	754,000	254,000	500,000
3-802.3-RME	3.14T	Morgans		4.0	3.0		3.5					3-3	Emergency	N/A	0
3-801.7-LWE	3.12T	Coulters			6.0		6.0					3-2	Emergency	N/A	0
3-799.8-LWP	3.09				35.0							3-1, 2, 3, 4, 5&6	1,185,000	258,000	927,000
			4.5	8.0	79.0	1.5	9.5	6.0	11.0	1.5	0.0		2,733,500	1,163,000	1,570,500
4-794.7-RMP	4.63	Red Wing Yacht Club		4.0			7.0					4-10	90,000	0	90,000
4-791.6-RMP	4.57	Red Wing Commercial Harbor								16.0		4-7, 8, 9&11	695,500	360,000	335,500
4-789.6-RMP	4.49				8.0							4-7	305,500	0	305,500
4-789.3-RMT	4.48 (4)				1.0							4-6	Rehandle	N/A	0
4-788.5-RMP	4.47	Colvill Park			6.0					5.0		4-7	90,000	0	90,000
4-785.0-RMP	4.37-8										13.0	4-6	274,000	0	274,000
4-762.7-LWT	4.29T	Reads Landing					9.5					4-5	Emergency	N/A	0
4-761.1-RMP	4.25	Carrels Pit									18.0	4-4&5	569,500	85,000	484,500
4-761.0-RMP	4.24	Wabasha Gravel Pit		8.0	2.0						50.0	4-4&5	2,264,000	85,000	2,179,000
4-759.7-RMP	4.20									6.4		4-1, 2, 3&4	323,000	85,000	238,000
4-759.5-RMP	4.19								5.7			4-4	231,000	85,000	146,000
4-759.4-RMT	4.18						3.0					4-3&4	Rehandle	N/A	0
4-757.5-LWE	4.13T	Teepeeota Point					7.5					4-3	Emergency	N/A	0
4-756.5-LWE	4.10T	Grand Encampment					4.0					4-2	Emergency	N/A	0
4-754.0-LWP	4.02	Alma Marina	10.3									4-1, 2&3	1,406,500	1,231,000	175,500
			10.3	12.0	17.0	0.0	31.0	0.0	5.7	27.4	81.0		6,249,000	1,571,000	4,678,000
5-749.8-RMP	5.24	West Newton Chute							36.0			5-5, 6, 7&8	1,402,000	41,000	1,361,000
5-748.0-RME	5.18T	Above West Newton					27.5					5-6&7	Emergency	N/A	0
5-745.8-RME	5.12T	Above Fisher Island					5.5					5-5	Emergency	N/A	0
5-744.0-RMP	5.30	Weaver Bottoms (5)		76.0								5-1, 2, 3&4	1,659,000	0	1,659,000
			0.0	0.0	0.0	0.0	33.0	0.0	36.0	0.0	0.0		3,061,000	41,000	3,020,000
5A-738.2-RMP	5A.36	L/D 5 Site			1.0		1.0					5A-5	49,500	49,500	0
5A-737.5-RMP	5A.23	Bass Camp			7.0							5A-5&6	724,000	15,500	708,500
5A-734.5-LWE	5A.14T	Island 58					7.0					5A-4&5	Emergency	N/A	0
5A-731.9-LWP	5A.25	Fountain City 1					6.0					5A-1, 2&4	260,000	40,000	220,000
5A-731.8-LWP	5A.32	Fountain City 2		29.0	5.0							5A-1, 2&3	1,336,000	0	1,336,000
5A-730.5-LWE	5A.08T	Wilds Bend			5.0		4.0					5A-2	Emergency	N/A	0
			0.0	29.0	18.0	0.0	18.0	0.0	0.0	0.0	0.0		2,369,500	105,000	2,264,500

Table 5-1. Dredged material placement sites for the GREAT I original plan.

Location	GREAT Site #	Site Name	Habitats Affected Under GREAT I Plan (acres)(1)									Dredge Cuts	Quantity Placed (c.y.)	Beneficial Use (c.y.)	Quantity Left (c.y.)
			OW	T345	T12	RB	OD	UF	AF	DT	AQ				
6-726.0-LMP	6.27	Winona Harbor					0.5					6-5&6	227,000	227,000	0
6-724.6-RMP	6.20						2.5					6-4	85,500	85,500	0
6-724.5-RMP	6.19						2.5					6-4	85,500	85,500	0
6-723.3-RMP	6.17	Winona Industrial Park (3)										6-1, 2, 3&4	514,000	514,000	0
6-720.5-RMP	6.11	Homer			9.0		2.0					6-1	272,500	272,500	0
			0.0	0.0	9.0	0.0	7.5	0.0	0.0	0.0	0.0		1,184,500	1,184,500	0
7-714.1-LWP	7.06	Trempealeau		14.0	7.0							7-2, 3, 4, 5&7	1,310,000	1,216,000	94,000
7-713.1-RMP	7.05	Hot Fish Shop		8.0	4.0							7-2&6	652,000	101,500	550,500
7-708.7-LWE	7.11T	Winters Landing					1.5					7-4	Emergency	N/A	0
7-706.5-RME	7.12T	Dakota Island					6.4					7-3	Emergency	N/A	0
7-705.2-RMP	7.01						1.2					7-1&2	100,000	100,000	0
7-702.5-RMP	7.20	L/D 7 Site								1.7		7-1&2	110,000	110,000	0
			0.0	22.0	11.0	0.0	9.1	0.0	0.0	1.7	0.0		2,172,000	1,527,500	644,500
8-700.0-RMP	8.28				4.0							8-10	33,000	0	33,000
8-695.7-LWP	8.06	Isle La Plume					44.0					9-2, 8-6, 7, 8, 9&10; 9-6, 7, 8, 9&10	1,647,500	1,647,500	0
8-690.4-LWE	8.17T	Above Brownsville					8.5					8-6	Emergency	N/A	0
8-688.7-RMP	8.30	Brownsville Containment		11.0	22.0		22.0					8-3, 4&5	1,911,500	645,000	1,266,500
8-684.7-LWP	8.22	Stoddard							4.0			8-1&2	97,000	97,000	0
			0.0	11.0	26.0	0.0	74.5	0.0	4.0	0.0	0.0		3,689,000	2,389,500	1,299,500
9-678.0-RME	9.21T	Island 126					10.0					9-9	Emergency	N/A	0
9-677.7-LWP	9.15	Genoa Power Plant								1.0		9-7, 8, 9&10	180,000	180,000	0
9-676.5-RME	9.20T	Twin Island		6.0	10.0		14.0					9-8	Emergency	N/A	0
9-671.8-LWP	9.11	Gantenbein		2.5	2.0					0.5		9-6, 7, 8, 9&10	296,000	128,000	168,000
9-671.3-LWP	9.33			1.0	12.0							9-6, 7, 8, 9&10	557,000	128,000	429,000
9-667.5-LWP	9.07	Desoto		10.0	3.0							9-4&5	548,500	200,000	348,500
9-665.8-RIE	9.18T	Indian Camp Light			2.7							9-4	Emergency	N/A	0
9-664.3-RIE	9.17T	Lansing					4.0					9-3	Emergency	N/A	0
9-663.5-RIP	9.26		22.0									9-2&3	320,500	0	320,500
9-663.0-RIP	9.03									4.1		9-3	55,000	55,000	0
9-660.0-RIP	9.47									1.0		9-1,2&3	143,000	126,000	17,000
9-652.3-LWP	9.41	Lynxville		2.0	2.0			4.5				9-1	52,000	52,000	0
			22.0	21.5	31.7	0.0	28.0	4.5	0.0	6.6	0.0		2,152,000	869,000	1,283,000

Table 5-1. Dredged material placement sites for the GREAT I original plan.

Location	GREAT Site #	Site Name	Habitats Affected Under GREAT I Plan (acres)(1) OW	T345	T12	RB	OD	UF	AF	DT	AQ	Dredge Cuts	Quantity Placed (c.y.)	Beneficial Use (c.y.)	Quantity Left (c.y.)
10-647.1-LWP	10.17	Varo Property			2.0					1.5		10-10	8,000	0	8,000
10-646.5-LWP	10.16	Gordon Bay Landing			6.0							10-9	272,500	272,500	0
10-644.5-RIE	10.22T	Jackson Island								3.0		10-8	Emergency	N/A	0
10-642.4-LWP	10.40	Mississippi Gardens							25.8			10-7, 8, 9&10	640,000	300,000	340,000
10-634.6-RIP	10.41				4.5							10-5	65,500	65,500	0
10-628.0-LWP	10.01	Wyalusing Pit									8.2	10-3&4	140,000	62,000	78,000
10-618.8-RIP	10.04	Esmann Island		8.2								10-2	207,000	0	207,000
10-615.5-RIP	10.02									5.5		10-1	53,500	12,000	41,500
			0.0	8.2	12.5	0.0	0.0	0.0	25.8	10.0	8.2		1,386,500	712,000	674,500
		Total for GREAT I Plan	114.8	111.7	250.7	70.0	210.6	10.5	82.5	146.1	121.7		36,419,900	16,326,500	20,093,400

Sites in orginal GREAT I plan that are no longer available, not needed, or are conditional substitutes depending on future development

Location	GREAT Site #	Site Name	Habitats Affected Under GREAT I Plan (acres)(1) OW	T345	T12	RB	OD	UF	AF	DT	AQ	Dredge Cuts	Quantity Placed (c.y.)	Beneficial Use (c.y.)	Quantity Left (c.y.)
MN-12.0-RMP	MN.06									24.0			Not needed		
2-837.2-LMP	2.02									69.0		2-7	No longer available		
4-791.5-RMP	4.54	Red Wing Harbor Site		1.0	2.0					5.0			Not needed		
5-751.5-LWP	5.26	Alma Railroad loop		5.0	10.0								Not needed		
5-751.2-LWP	5.26A	Alma Generating Station			15.0								Not needed		
5-747.5-LWP	5.28										15.0		Not needed		
9-662.2-RIP	9.28			22.0	11.0							9-3	Conditional - with marina develop		
10-616.0-RIP	10.03								10.0				Not needed		
			0.0	28.0	38.0	0.0	0.0	0.0	10.0	98.0	15.0				

(1) Habitat classifications:

OW = open water, could include main channel border, side channel/slough habitat, etc.
T345 = fresh marsh wetlands consisting of type 3 (shallow), 4 (deep) and 5 (open water) wetlands
T12 = bottomland forests and inland fresh meadows (type 1 and 2 wetlands, respectively)
RB = recreational beach
OD = old dredged material deposits in various stages of revegetation, does not include bare sand
UF = upland forest and/or brush, grassland or old field, woody or herbaceous vegetation dominant
AF = agricultural field, areas devoted to production of annual crops, pastures or landscape nurseries
DT = disturbed terrestrial areas dominated by industrial, commercial and residential use
AQ = abandoned quarry

(2) No acreage would be required at this site; material would be removed from barges by a private company and placed elsewhere.
(3) Placement of materials at these sites is conditional upon landowner meeting all Federal, State and local regulatory requirements. Acreages affected are undetermined, dependent on development plans of individual landowners. Mitigation for wetland acres filled at these sites using dredged materials provided by the District is the responsibility of the landowner. Acreages affected are not listed in table nor included in acreage totals.
(4) This site was identified as an 8-acre site under GREAT I, however, only 1 acre would be necessary for dredged material placement, considering the site would be used as a rehandling site.
(5) The effects of the Weaver Bottoms project have been assessed under a separate environmental document, acres affected are not included in totals.

Table 5-2. Dredged material placement sites for the Channel Maintenance Management Plan (CMMP).

Location	GREAT Site #	Site Name	Habitats Affected Under CMMP (acres)(1)									Method(2)	Dredge Cuts	Quantity Placed (c.y.)	Beneficial Use (c.y.)	Quantity Left (c.y.)
			OW	T345	T12	RB	OD	UF	AF	DT	AQ					
MN-13.5-RMP	MN.03	Cargill			7.0							H&M	MN-4&5	137,000	137,000	0
MN-12.1-RMP	-	Kraemer Site								5.0		H&M	MN-3B, 3C, 4&5	348,500	348,500	0
MN-10.1-RMP	-	NSP Site								7.0		H&M	MN-3A, 3B, 3C, 4&5	39,000	39,000	0
MN-7.3-RMP	-	Hwy. 77 Bridge							4.0			M	MN-2	80,000	80,000	0
			0.0	0.0	7.0	0.0	0.0	0.0	4.0	12.0	0.0			604,500	604,500	0
SC-6.7-LWP	SC.13	Kinnickinnic Bar Upper				1.0	3.0					H&M	SC-1	17,000	0	17,000
SC-6.5-LWP	SC.12	Kinnickinnic Bar Lower				2.0	5.0					H&M	SC-1	31,500	0	31,500
			0.0	0.0	0.0	3.0	8.0	0.0	0.0	0.0	0.0			48,500	0	48,500
U-856.6-RMP	-	USAF Site								7.0		M&H	USAF-1A, 1B, 2&3	1,505,000	1,505,000	0
			0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0	0.0			1,505,000	1,505,000	0
1-853.2-LMP	1.01A	Pool 1 Site								2.0		M	All cuts in Pool 1	3,034,000	3,034,000	0
1-851.3-LME	1.07T	Below Franklin Avenue					5.0					H	1-5&6	Emergency	N/A	0
1-849.5-RME	1.03T	Below Lake Street					4.0					H	1-3&4	Emergency	N/A	0
			0.0	0.0	0.0	0.0	9.0	0.0	0.0	2.0	0.0			3,034,000	3,034,000	0
2-840.4-RMP	2.16	Highbridge								4.0		M&H	MN-1; 2-9	474,000	474,000	0
2-838.2-RMP	2.15	Northport								6.0		M&H	MN-1; 2-9	261,000	0	261,000
2-837.5-RMP	2.40	St. Paul Barge Terminal	28.0									H&M	2-7	1,220,000	0	1,220,000
2-836.8-RMP	2.14	Holman field (3)										H	2-7	608,000	0	608,000
2-836.3-RMP	2.13	Southport			18.0							H	2-7	200,000	0	200,000
2-823.8-LMT	2.25T	Pine Bend					8.0					H&M	2-2, 3, 4&5B	Rehandle	N/A	0
2-823.8-RMP	-	C.F. Industries (4)					1.0				6.0	M	2-2, 3, 4&5B	see footnote (4)		
2-822.5-LMP	-	Shiely Pit									15.0	H	transfer sites in Pool 2	1,357,500	0	1,357,500
2-821.5-LMT	-	Upper Boulanger					4.0					H&M	2-2, 3, 4, 5A&5B	Rehandle	N/A	0
2-821.1-LMT	2.31T	Lower Boulanger			3.0		5.0					H&M	2-2, 3, 4, 5A&5B	Rehandle	N/A	0
			28.0	0.0	21.0	0.0	18.0	0.0	0.0	10.0	21.0			4,120,500	474,000	3,646,500
3-815.1-RMP	-	Hastings								1.0		M	3-5A, 5B, 7&9	Emergency	n/a	0
3-814.7-RMP	-	Koch								7.0		M	3-5A, 5B, 7&9	61,500	61,500	0
3-813.2-RMP	3.46	Hastings Harbor							11.0			M	3-5A, 5B, 7&9	145,500	145,500	0
3-811.5-LMP	3.34	Point Douglas		4.0				6.0				M&H	SC-1; 3-5A&7	400,000	0	400,000
3-808.4-LWP	3.27	Dry Run Slough			13.0							H&M	3-4&5A	590,500	254,000	336,500
3-802.3-RME	3.14T	Morgans			3.0							H&M	3-1, 2, 3&4	Emergency	N/A	0
3-801.7-LWE	3.12T	Coulters			2.0		1.0					H&M	3-1, 2, 3&4	Emergency	N/A	0
3-799.2-RMT	3.07	Corps Island			2.0		5.0					M	3-1, 2, 3&4	Rehandle	N/A	0
3-798.0-LWP	-	County/Private Gravel Pit									31.0	H	site 3-799.2-RMT	470,000	470,000	0
			0.0	4.0	20.0	0.0	6.0	6.0	11.0	8.0	31.0			1,667,500	931,000	736,500

Table 5-2. Dredged material placement sites for the Channel Maintenance Management Plan (CMMP).

Location	GREAT Site #	Site Name	Habitats Affected Under CMMP (acres)(1) OW	T345	T12	RB	OD	UF	AF	DT	AQ	Method(2)	Dredge Cuts	Quantity Placed (c.y.)	Beneficial Use (c.y.)	Quantity Left (c.y.)
4-794.7-RMP	4.63	Red Wing Yacht Club			2.0		4.0					H	4-10	25,000	25,000	0
4-791.6-RMP	4.57	Red Wing Commercial Harbor			2.0					11.0		M	4-7, 8, 9&10	1,336,500	754,000	582,500
4-788.5-RMP	4.47	Colvill Park (5)								5.0		H&M	4-6, 7&8		see footnote (5)	
4-762.7-LWT	4.29T	Reads Landing					22.0					H	4-5A&5B	Rehandle	N/A	0
4-761.1-RMP	4.25	Carrels Pit (6)									18.0	H&M	4-4&5A		see footnote (6)	
4-761.0-RMP	4.24	Wabasha Gravel Pit		8.0	2.0						76.0	H	site 4-762.7-LWT; 4-5B	2,264,000	0	2,264,000
4-760.2-RMP	MDNR.2	MDNR.2									30.0	H	site 4-759.3-LWT	700,500	0	700,500
4-759.5-RMP	4.19								6.0			H	site 4-759.3-LWT	90,000	0	90,000
4-759.3-RMP	4.17						3.0					H	site 4-759.3-LWT	10,000	0	10,000
4-759.3-LWT	4.16T	Crats Island					22.0					H	4-4	Rehandle	N/A	0
4-757.5-LW	4.13T	Teepeeota Point					46.0					H	4-3	972,000	0	972,000
4-756.5-LWT	4.10T	Grand Encampment					8.0					H	4-2	Rehandle	N/A	0
4-754.0-LWP	4.02	Alma Marina	3.0				4.0					M&H	site 4-756.5-LWT; 4-1, 2	757,500	600,000	157,500
			3.0	8.0	6.0	0.0	109.0	0.0	6.0	16.0	124.0			6,155,500	1,379,000	4,776,500
5-749.8-RMP	5.24	West Newton Chute							39.0			M&H	5-5, 6, 7&8	1,402,000	41,000	1,361,000
5-748.0-RMT	5.18T	Above West Newton					14.0					H	5-6&7	Rehandle	N/A	0
5-745.8-RMT	5.12T	Above Fisher Island					14.0					H	5-4&5	Rehandle	N/A	0
5-744.7-LWT	5.08T	Lost Island					18.0					H	5-3&4	Rehandle	N/A	0
5-744.0-RMP	5.30	Weaver Bottoms (7)		108.0								H&M	transfer sites in pool 5	1,523,000	0	1,523,000
			0.0	0.0	0.0	0.0	46.0	0.0	39.0	0.0	0.0			2,925,000	41,000	2,884,000
5A-738.2-RMP	5A.36	L/D 5 Site			1.0		1.0					M	5A-5	80,000	80,000	0
5A-734.5-LWE	5A.14T	Island 58					3.0					H	5A-4&5	Emergency	N/A	0
5A-733.5-LWP	-	Fountain City Service Base	2.0									M	site 5A-734.5-LWE	70,000	0	70,000
5A-731.9-LWP	5A.25	Fountain City 1					6.0					H&M	5A-1, 2, 3&4	954,000	864,000	90,000
5A-731.8-LWP	5A.32	Fountain City 2		14.0	8.0							H&M	5A-2, 3&4	764,500	0	764,500
5A-730.5-LWT	5A.08T	Wilds Bend					8.0					H	5A-2&3	Rehandle	N/A	0
			2.0	14.0	9.0	0.0	18.0	0.0	0.0	0.0	0.0			1,868,500	944,000	924,500
6-726.3-RMP	-	Winona Commercial Harbor								6.0		M	6-3	434,000	434,000	0
6-726.0-LMP	6.27	Winona Small Boat Harbor (8)					1.0					M	various historic cuts		see footnote (8)	
6-720.5-RMP	6.11	Homer			8.0		2.0					M&H	6-1&2	352,500	352,500	0
			0.0	0.0	8.0	0.0	3.0	0.0	0.0	6.0	0.0			786,500	786,500	0
7-714.1-LWP	7.06	Trempealeau		5.0								H&M	7-4, 6&7	813,500	800,000	13,500
7-713.1-RMP	7.05	Hot Fish Shop					3.0					M	7-2B, 3, 4&6	400,000	400,000	0
7-708.7-LWE	7.11T	Winters Landing			1.0		1.0					H&M	7-4	Emergency	N/A	0
7-707.3-RMP	7.25A	Dakota Boat Ramp			5.0							H	site 7-706.5-RMT; 7-3	873,500	873,500	0
7-706.5-RMT	7.12T	Dakota Island					8.0					H&M	7-3	Rehandle	N/A	0
			0.0	5.0	6.0	0.0	12.0	0.0	0.0	0.0	0.0			2,087,000	2,073,500	13,500
8-695.7-LWP	8.06	Isle La Plume								9.0		M	8-6, 7, 9&10; 9-4, 8&9	1,952,500	1,952,500	0
8-690.4-LWT	8.17T	Above Brownsville					14.0					H	8-6	Rehandle	N/A	0
8-688.7-RMP	8.30	Brownsville Containment		6.0	11.0		17.0		2.0			H&M	8-3, 4&5	1,911,500	645,000	1,266,500
			0.0	6.0	11.0	0.0	31.0	0.0	2.0	9.0	0.0			3,864,000	2,597,500	1,266,500

Table 5-2. Dredged material placement sites for the Channel Maintenance Management Plan (CMMP).

Location	GREAT Site #	Site Name	Habitats Affected Under CMMP (acres)(1) OW	T345	T12	RB	OD	UF	AF	DT	AQ	Method(2)	Dredge Cuts	Quantity Placed (c.y.)	Beneficial Use (c.y.)	Quantity Left (c.y.)
9-677.7-LWP	9.15	Genoa Power Plant								2.0		M	9-7, 8&10	392,500	392,500	0
9-670.5-LWP	9.55	Blackhawk Park	3.0	2.0	36.0		7.0			21.0		M&H	9-4&6	860,000	460,000	400,000
9-665.8-RIE	9.18T	Indian Camp Light					3.0					H	9-4	Emergency	N/A	0
9-664.3-RIT	9.17T	Lansing					9.0					H	9-3&4	Rehandle	N/A	0
9-663.5-LWP	9.50	Lansing Highway Bridge			5.0							M	9-3&4	469,000	340,000	129,000
			3.0	2.0	41.0	0.0	19.0	0.0	0.0	23.0	0.0			1,721,500	1,192,500	529,000
10-647.1-LWP	10.17	Varo Property			2.0					2.0		H&M	10-9	272,500	272,500	0
10-644.5-RIE	10.22T	Jackson Island								3.0		H	10-8	Emergency	N/A	0
10-643.5-LWI	-	Jackson Rehandle	3.0									H	10-8	Rehandle	N/A	0
10-642.4-LWP	10.40	Mississippi Gardens							4.0			H	10-7&8	640,000	640,000	0
10-635.0-LWP	10.43	Prairie Muncipal Dock (9)					5.0					M	10-6		see footnote (9)	
10-628.0-LWP	10.01	Wyalusing Pit									6.0	H	10-3	123,000	123,000	0
10-627.8-LWP	10.24	Wyalusing Beach				2.0						M	10-3	10,000	0	10,000
10-618.7-RIT	10.18	McMillan Island		1.0	1.0		3.0					H&M	10-2	Rehandle	N/A	0
10-618.0-RIP	-	Buck Creek			2.0				8.0			H	site 10-618.7-RIT	535,000	175,000	360,000
			3.0	1.0	5.0	2.0	8.0	0.0	12.0	5.0	6.0			1,580,500	1,210,500	370,000
		TOTAL	39.0	40.0	134.0	5.0	287.0	6.0	74.0	98.0	182.0			31,968,500	16,773,000	15,195,500
														Passive Beneficial use		8,224,000
														Non-Beneficial use		6,971,500

(1) Habitat classifications:
OW = open water, could include main channel border, side channel/slough habitat, etc.
T345 = fresh marsh wetlands consisting of type 3 (shallow), 4 (deep) and 5 (open water) wetlands
T12 = bottomland forests and inland fresh meadows (type 1 and 2 wetlands, respectively)
RB = recreational beach
OD = old dredged material deposits in various stages of revegetation, does not include bare sand
UF = upland forest and/or brush, grassland or old field, woody or herbaceous vegetation dominant
AF = agricultural field, areas devoted to production of annual crops, pastures or landscape nurseries
DT = disturbed terrestrial areas dominated by industrial, commercial and residential use
AQ = abandoned quarry

(2) Two methods of disposal are proposed, H = hydraulic and M = mechanical. The method listed first is preferred.
(3) Placement of materials at this site is conditional upon landowner meeting all Federal, State and local regulatory requirements. Acreages affected are undetermined, dependent on development plans of individual landowner. Mitigation for wetland acres filled at this site using dredged materials provided by the District is the responsibility of the landowner. Acreages affected are not listed in table nor included in acreage totals.
(4) Site 2-823.8-RMP is privately owned. The landowner has discretion over how much material is placed at the site and where it is placed.
(5) Placement of materials at this site would be contingent upon the city of Red Wing's demand for material.
(6) Site 4-761.1-RMP would be used to supplement the CMMP and provide greater longevity to the recommended sites. Quantity estimates would be developed if and when site use is required.
(7) The effects of the Weaver Bottoms project have been assessed under a separate environmental document, acres affected are not included in totals.
(8) Use of site 6-726.0-LMP may not be required once site 6-726.3-RMP is fully developed and a long-term real estate agreement is obtained.
(9) Dredging in the East Channel has been deferred and development of this site is not anticipated (see U.S. Army Corps of Engineers/Wisconsin Department of Natural Resources 1996).

Pollutants can enter the water column during dredging, as bottom sediments are either hydraulically or mechanically removed. Bottom sediments can also be resuspended by prop wash during the dredging operations.

Dredging resuspends bottom sediments, increasing turbidity and exposing settled pollutants. Major pollutants associated with dredging include: resuspended sediments and turbidity; heavy metals; chlorinated hydrocarbon pesticides and PCB's; nutrients, particularly phosphorus and nitrogen; chemical oxygen demand (COD); and occasionally other pollutants such as oil, grease, or bacteria. Aquatic organisms can be affected through heavy metal uptake, coverage by settling sediment, oxygen depletion of the water column, and reduced light penetration with resultant reduced photosynthesis.

Turbidity clouds the water reducing light penetration and limits photosynthesis in macrophytes and phytoplankton. Resuspended sediments can cover benthic organisms; affect respiration, feeding, and reproduction in fish; interfere with nutrient uptake, photosynthesis, and dissolved gas exchange in macrophytes and phytoplankton; flocculate planktonic algae; decrease food availability for aquatic organisms; deplete oxygen resources; and release noxious materials into the water column. However, numerous studies on the effects of dredging have shown increases in turbidity and suspended solids are generally local and short-term.

Metals may occur as soluble, insoluble, complexed interstitial (between sediment particles), and/or adsorbed to either fine-grained or organic sediments. The soluble metals are of particular concern to dredging operations. Sediments disturbed and exposed during dredging exert an oxygen demand and can create anoxic or near anoxic conditions. Many metals are soluble under these conditions. Dilution and aeration return conditions to oxic within a relatively short period, and the metals again become insoluble, are scavenged by iron oxides, or adhere to settling sediment or organic particles (Blom et al. 1976; Chen et al. 1976; Lee et al. 1975). However, in some instances, concentrations of one or more metals may remain in the water column due to particular conditions at that site. It should be noted that releases of metals under short-term conditions such as those produced during the dredging process are usually minor and water quality standards only rarely are exceeded.

Pesticides and PCB's are most often associated with fine-grained or organic sediments. But, because of the strong adsorbance tendencies of pesticides and PCB's, dredging will generally cause the release of only minor amounts of these pollutants to the water column. In addition, those pesticides and PCB's which are released are usually quickly scavenged by suspended sediment or iron oxides.

Under anoxic conditions, such as those that can occur during dredging, ammonia (NH_3-N) and organic nitrogen may be released. Under certain conditions, ammonia (NH_3-N) concentrations may reach toxic levels. However, as oxic conditions are restored through dilution and aeration, the ammonia (NH_3-N) is transformed to nitrite (NO_3-N) and then nitrate (NO_2-N) by naturally

occurring bacteria. Soluble ammonia (NH_3-N) is readily available for uptake by a wide variety of organisms, while organic nitrogen is available primarily to filter feeders.

Phosphorus (P) may also be solubilized or resuspended during dredging in much the same way as nitrogen. Ortho-PO_4, the most common form of phosphorus encountered during dredging, is slightly soluble under anoxic conditions, and its initial release during dredging operations may be relatively high. However, phosphorus readily adsorbs to fine-grained sediments and organic particles as oxic conditions return. Under most circumstances, the initial release of phosphorus lasts only a short time, with the phosphorus quickly settling out of the water column or being used by aquatic organisms.

Dredging creates immediate oxygen demands, both biological and chemical (as discussed above), and generally results in localized short-term deficiencies of dissolved oxygen (DO). Dilution and aeration return DO to ambient conditions within a short time after dredging operations have ceased.

Anticipated impacts on water quality are generally related to the equipment type used to complete a dredging job. Hydraulic equipment tends to have a lesser impact on water quality at the dredge cut site than mechanical equipment. However, both equipment types have relatively minor effects on water quality. The CMMP emphasizes the use of Government hydraulic dredging equipment which, as discussed, has lesser impacts on water quality at the dredge cut site than mechanical equipment. Additionally, fewer cuts are considered active under the CMMP. Overall, the CMMP would have lesser impacts on water quality as a result of dredging than the GREAT I plan, although, the effects on water quality under both plans would be minor (Table 5-3 and 5-4).

With the exception of the Minnesota River, pool 1, pool 2, and the small boat and commercial harbors, the sediments in the main channel are uncontaminated medium to coarse sands. Dredging these sediments would have little impacts on water quality. For those pools listed above with contamination and/or finer silt or muck substrates, resuspension of bottom sediments during dredging could result in minor to substantial adverse impacts on water quality, regardless of the plan.

Hydraulic placement of materials on upland placement sites normally requires a ponding or settling basin from which an effluent is discharged. The quality of this effluent depends on the quality, in terms of contaminants, of the sediments placed at the site. In areas with sediment contamination problems (i.e., the Twin Cities metropolitan area), effluent discharge from placement sites could affect water quality downstream of the effluent.

As discussed above, impacts on water quality are generally related to the equipment type used to complete a dredging job. In contrast to impacts at the dredging location, hydraulic equipment tends to have a greater impact on water quality at the placement site than mechanical equipment. Mechanical equipment, for the most part, has no affect on water quality during placement. With

Table 5-3. Environmental assessment matrix (Section 122 of the River and Harbor and Flood Control Act of 1970 [P.L. 91-611]), dredging and dredged material placement under the GREAT I plan.

	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values					X		
3. Recreational Opportunities		X					
4. Transportation	X						
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use					X		
10. Controversy					X		
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services		X					
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply			X				
8. Commercial Navigation	X						
9. Floodplain Effects				X			
10. Energy Needs and Resources			X				
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat						X	
3. Wetlands						X	
4. Aquatic Habitat						X	
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				U*			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

Table 5-4. Environmental assessment matrix (Section 122 of the River and Harbor and Flood Control Act of 1970 [P.L. 91-611]), dredging and dredged material placement under the CMMP.

	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values						X	
3. Recreational Opportunities		X					
4. Transportation	X						
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use					X		
10. Controversy					X		
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services		X					
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply			X				
8. Commercial Navigation	X						
9. Floodplain Effects				X			
10. Energy Needs and Resources			X				
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat						X	
3. Wetlands						X	
4. Aquatic Habitat						X	
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				X	U*		
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

hydraulic placement, an effluent return is generated, and when discharged to the riverine environment, has adverse impacts on water quality. The CMMP emphasizes the use of Government hydraulic dredging equipment which, as discussed, has greater impacts on water quality than mechanical equipment. However, fewer cuts are considered active under the CMMP. Overall both plans would have only minor impacts on surface water quality.

The potential to affect groundwater quality is very site-specific. Most of the placement sites are within the floodplain and at or near the groundwater table. In these areas the groundwater table falls and rises with the water surface elevation of the river. Any impact on groundwater quality would be minor and of short duration. Mechanical placement of clean dredge material at sites located out of the floodplain would not have any appreciable effect on groundwater quality. Hydraulic placement of dredge material at sites that are located out of the floodplain on the glacial sand terraces have greater potential to affect groundwater quality. The potential adverse impact on groundwater is greatest when there are private or municipal wells located immediately adjacent to or down-gradient from the placement site. Surface water and sediment quality will also greatly influence the potential for adverse impacts on groundwater quality. Hydraulic transfers of large quantities dredge material will also have the greatest potential for adverse impacts on groundwater. Three groundwater monitoring studies have been performed on historical dredge material transfers in lower pool 4 and are summarized below. One of the problems with all of the studies completed to date has been the lack of adequate information on pre-project conditions to describe normal seasonal variability in the wells tested.

In 1984 and 1985, approximately 1.4 million cubic yards of dredged material was hydraulically dredged from the main navigation channel at river mile 762.5, the Chippewa sediment trap, and the Reads Landing containment site (4-762.7-LWT). This material was transferred to the Wabasha Gravel Pit (4-761.1-RMP). A similar transfer of approximately 1 million cubic yards of dredged material was completed in 1995. Groundwater monitoring was completed for both transfer operations. In the 1985/86 transfer, 2 of the 6 monitoring wells showed infiltration by the dredge carriage water. In 1995, water level, water temperature, specific conductance, and some of the metals (specifically arsenic) indicate that the dredge carriage water seeped into the 6 monitoring wells and the Wabasha City well. The 1995 transfer occurred substantially closer to the City well than the 1985/86 transfer. The next transfer will come even closer to the City well and mitigative measures may be necessary to ensure that no unacceptable impacts occur on the City well. In the 1995 transfer, one of the private wells exhibited a temperature and specific conductance change that suggested that during the later portion of the transfer a brief incursion of dredge carriage water occurred. None of the other private wells showed evidence of being directly impacted by the dredging operation. There were physical and chemical changes in some of the private wells that could have been a result of modifications of the groundwater flow patterns from the dredged material placement or form normal seasonal variability. Zinc was detected in all private wells, including two exceedances of the Minnesota State health risk limit. However, it appeared to not be related to the dredge material transfer project.

In 1987, approximately 800,000 cubic yards of dredge material was hydraulically transferred from the Crats Island containment site (4-759.3-LWT) to the long-term MDNR.2 placement site (4-760.2-RMP). Groundwater monitoring was conducted for this transfer operation. Heavy metals, pesticides, and various organic compounds were not detected at elevated levels in any of the monitoring or private wells tested as a result of the dredged material relocation project. These same pollutants were also not detected in any of the wells at levels of concern for human health. Conductivity, pH, and fecal coliforms did not show any project related changes in values. Temperatures may have been elevated in some of the private wells. Nitrate concentrations were elevated as a result of the dredged material transfer project in all wells within 1,200 feet of the edge of the MDNR.2 placement site. None of the nitrate values in the private wells were above the drinking water criteria. Near the end of the dredge material operation all wells had returned to values comparable to pre-project conditions. It is postulated that based on the spatial and temporal patterns observed in the nitrates data, the dredge carriage water may have mobilized an unknown, historical spill of fertilizer in the MDNR.2 gravel pit.

The placement sites in the CMMP with the greatest potential for impacts on public or private wells are discussed below. The remaining placement sites in the CMMP have minimal potential for adverse impacts on wells because of their location relative to the groundwater table and distance from any private or municipal wells. Further investigations into the potential for groundwater impacts, including groundwater monitoring, may be necessary for some of the sites discussed below. Site history assessments will also need to be conducted for many of these sites to determine if there may be a concern with historical contamination of the soils at the site. The St. Paul District will continue to coordinate placement activities with the appropriate State Regulatory Authorities.

Shiely Pit (2-822.5-LMP) - Dredge material is to be placed hydraulically in large quantities. Sediments are moderately contaminated and surface water quality is generally poor. Residential wells are located greater than 2,000 feet from the proposed placement site. However, there is a potential for adverse impacts on private wells, because of the large quantity of dredged material to be placed at this site and concerns with sediment and surface water quality.

County Gravel Pit (3-800.0-LWP) - Dredge material is to be placed hydraulically in large quantities. There is some concern with sediment contaminants and surface water quality. Residential wells are located greater than 2,000 feet, but are down-gradient, from the placement site. There is a potential for adverse impacts on private wells.

Private Gravel Pit (3-798.0-LWP) - Effluent is to be pumped from Pierce County Gravel Pit. There is some concern with sediment contaminants and surface water quality. Residential wells are located greater than 2,000 feet from the placement site. There will likely be minimal adverse impacts, because of the distance and location to the nearest private well.

Carrels Pit (4-761.1-RMP) - Dredge material to be placed hydraulically in large quantities. The sediments are relatively clean and water quality is generally good in the project area. Residential

wells are located within 200 feet of placement site. There is a potential for adverse impact on private wells.

Wabasha Gravel Pit (4-761.0-RMP) - Dredge material is to be placed hydraulically in large quantities. The sediments are relatively clean and water quality is generally good in the project area. Residential and municipal wells are located within 1000 feet of placement site and down-gradient. There is a potential for adverse impact on private and municipal wells.

West Newton Chute (5-749.8-RMP) - Dredge material is to be placed hydraulically in large quantities. The sediments are relatively clean and water quality is generally good in the project area. Residential buildings are located immediately adjacent to the placement site. The site is large enough to position the actual placement site down-gradient and greater than 1000 feet from the nearest well. With correct positioning of the placement site, no adverse impacts on private or municipal wells are anticipated.

Fountain City 2 (5A-731.8-LWP) - Dredge material is to be placed hydraulically in large quantities. The sediments are relatively clean and water quality is generally good in the project area. The site is within the floodplain, but commercial and residential buildings are located immediately adjacent (less than 200 feet) to the placement site. There is a potential for adverse impact on private wells.

Homer (6-720.5-RMP) - Dredge material is to be placed hydraulically in small quantities directly from the dredge cut, as needed. The sediments are relatively clean and water quality is generally good in the project area. The site is within the floodplain, but residential buildings are located immediately adjacent (less than 200 feet). There is a low potential for adverse impact on private wells because of the relatively small quantities per dredging event.

Dakota Boat Ramp (7-707.3-RMP) - Dredge material is to be placed hydraulically in relatively large quantities from the Dakota Island transfer site. The sediments are relatively clean and water quality is generally good in the project area. The site is within the floodplain, but residential buildings are located immediately adjacent (less than 200 feet). There is a potential for adverse impact on private wells.

Varo Property (10-647.1-LWP) - Dredge material is to be placed hydraulically in small quantities directly from the dredge cut, as needed. The sediments are relatively clean and water quality is generally good in the project area. The site is within the floodplain, but residential buildings are located immediately adjacent. It is unknown whether these residential areas have wells. There is a low potential for adverse impact on private wells because of the relatively small quantities per dredging event.

Wyalusing Pit (10-628.0-LWP) - Dredge material is to be placed hydraulically in small quantities directly from cut, as needed. The sediments are relatively clean and water quality is generally good in the project area. Residential buildings are located immediately adjacent to but

up gradient of the placement site. There is a low potential for adverse impact on private wells because of the relatively small quantities per dredging event.

5.1.2 Effects of Dredging and Dredged Material Placement on Fish and Wildlife Resources

Dredging primarily affects the main channel of the river. However, it also can affect backwaters, lakes, and tributaries, some of the important breeding, nursery, and feeding areas of both fish and wildlife. It can affect fish and wildlife through direct removal or through secondary impacts on aquatic habitats and water quality.

Channel maintenance dredging is frequently required and conducted in areas of shifting/shoaling bedload. The unstable substrates typically found in frequently dredged areas are generally an inhospitable habitat for most aquatic species. As a result, the dredging action at high frequency sites itself has only minor impacts on aquatic habitats and species usage of these habitats. The impacts are much greater when dredging at slow developing shoal areas which require only infrequent dredging. The greater stability of the substrates allows a more diverse benthic fauna, including mussels, to develop between dredging events.

Dredging can result in the direct physical removal of aquatic invertebrates from dredge cut locations, and subsequent deposition at a disposal site. Species such as freshwater mussels, in addition to being susceptible to local extermination, can be affected by turbidity, intakes of resuspended pollutants, direct coverage by settling sediments produced during the dredging process, and reduced oxygen levels. Suspended solids and sedimentation due to dredging can cause clogging and abrasion of gills and other respiratory surfaces in filter feeders like freshwater mussels. However, the instability of substrates found in frequently dredged areas is normally unsuitable for colonization by most freshwater mussel species. As a result, dredging usually has little affect on freshwater mussels, although frequent dredging probably precludes the establishment of mussel beds in some locations.

Following dredging, bottom substrates in dredge cuts are often unstable or shifting for some time, providing poor habitat for recolonization of these areas by aquatic invertebrates (Burky 1983). Also, in the case of freshwater mussel species, the habitat conditions existing after dredging may not be suitable for use by fish host species, further delaying recolonization efforts. Miller and Payne (1992) collected Higgins' eye pearly mussels from a location in the East Channel of the UMR at Prairie du Chien, Wisconsin, which had been previously dredged, indicating that recolonization of dredge cut areas does occur. However, an interval of eight years had passed between the dredging operation and Miller and Payne's study. Periodic dredging prevents the establishment of mussel beds in otherwise suitable habitats.

During hydraulic dredging operations, the possibility exists for fish to enter the pipeline with the bottom sediments; however, this is very unlikely. Suspended solids and sedimentation caused by dredging can clog and abrade the gills and other respiratory surfaces in fish. Dredging can affect

reproduction through coverage of eggs, increased susceptibility to disease, increased uptake of pollutants, and changed predator/prey relationships through reduced visibility.

Dredging can affect plants through interference with light penetration and photosynthesis, changed nutrient uptake, interference with dissolved gas exchange, abrasion, and direct coverage.

However, except for direct removal, the effects of dredging are local, primarily encompassing the immediate dredging location and the area influenced by the downstream turbidity plume. In addition, the direct effects of dredging are minor when compared to other man-induced impacts on fish and wildlife such as those caused by pollutant input into the river from both point and non-point sources, and sediment input into the river due to agricultural practices.

To evaluate the impacts of dredging an estimate of the main channel affected was made by multiplying the width of the channel times the length of channel where historical dredging has occurred (Table 5-5). Dredging is normally done in a much smaller area and frequently occurs in the same specific location. Additionally, with the exception of a few high frequency cuts, most cuts in the District are maintained on an infrequent basis (see Table A-1 in Appendix A). Of the historically maintained dredge cuts in the District, approximately 48 percent actually require dredging less than once every five years. Approximately 20 percent require dredging once every two years. For these reasons, the effects discussed below are probably overstated.

Table 5-5 provides comparisons of the impacts of the GREAT I plan and CMMP on aquatic habitats. Estimates of main channel and total aquatic acreage provided in Table 5-5 were obtained from Olson and Meyer (1976) and USACE (1983). Under the GREAT I plan, maintenance dredging would disturb substrates in an estimated 3,894 acres of main channel habitat. Comparably, the CMMP would disturb an estimated 2,988 acres of main channel habitat. An estimated 147,620 acres of aquatic habitat exists in the St. Paul District's portion of the UMR and the navigable portions of the Minnesota and St. Croix Rivers. Excluding the USAF and LSAF pools, approximately 8.4 percent (12,356 acres) is classified as main channel habitat. Both the GREAT I and CMMP would disturb substantial portions of the main channel habitat present in most pools. In total, 31.5 percent and 24.2 percent of the main channel habitat would be disturbed by the GREAT I plan and CMMP, respectively. However, only 2.6 percent and 2.0 percent of the total aquatic habitat present would be disturbed under the GREAT I and CMMP plans, respectively. As a result, on a system-wide basis the impacts of dredging under either plan on aquatic habitats would be minor, however, a substantial amount of main channel habitat would be disturbed (Table 5-3 and 5-4). The CMMP would have lesser impacts than the GREAT I plan because of the reduced number of cuts and thus acres of main channel habitat affected under the CMMP.

Most wildlife species endemic to the river do not make extensive use of the main channel. However, main channel habitat is important for many endemic species of fish, native mussels, as overwintering and nursery habitat for catfish, and for other species specific uses. Dredging

Table 5-5. Comparison of the impacts of the GREAT I and CMMP plans on aquatic habitats.

Pool	Main Channel (acres)*	Total Aquatic (acres)*	Main Channel Dredging (acres)		Percent of Main Channel Habitat Affected		Percent of Total Aquatic Habitat Affected	
			GREAT	CMMP	GREAT	CMMP	GREAT	CMMP
Minnesota	585	1,478	37.6	37.6	6.4%	6.4%	2.5%	2.5%
St. Croix	0	8,047	67.9	12.1	0.0%	0.0%	0.8%	0.2%
USAF & LSAF	no data	1,025	49.1	49.1	no data	no data	4.8%	4.8%
Pool 1	500	534	116.4	116.4	23.3%	23.3%	21.8%	21.8%
Pool 2	1,484	9,738	347.9	241.2	23.4%	16.3%	3.6%	2.5%
Pool 3	845	6,302	477.6	375.8	56.5%	44.5%	7.6%	6.0%
Pool 4	2,243	34,134	522.4	489.7	23.3%	21.8%	1.5%	1.4%
Pool 5	578	9,706	333.3	309.1	57.7%	53.5%	3.4%	3.2%
Pool 5A	393	4,431	235.8	184.8	60.0%	47.0%	5.3%	4.2%
Pool 6	696	6,782	148.5	106.7	21.3%	15.3%	2.2%	1.6%
Pool 7	477	11,031	287.9	263.6	60.4%	55.3%	2.6%	2.4%
Pool 8	1,036	16,027	406.1	333.3	39.2%	32.2%	2.5%	2.1%
Pool 9	1,622	24,072	365.5	252.7	22.5%	15.6%	1.5%	1.0%
Pool 10	1,897	14,313	498.2	215.8	26.3%	11.4%	3.5%	1.5%
Totals	12,356	147,620	3,894	2,988	31.5%	24.2%	2.6%	2.0%

* Acreage estimates obtained from Olson and Meyer (1976) and USACE (1983); see Table 4-1.

temporarily removes any natural features like dunes and sand waves that can be important-habitat for some fish species. However, dredge cuts are generally located in areas of rapid shoaling, and the unstable nature of the habitat that this presents limits the value of these areas to main channel organisms. In pool 1 the aquatic habitat present is limited mostly to main channel habitat (Table 5-5). Of the 534 acres of aquatic habitat present in pool 1, 93 percent (500 acres) is main channel habitat. Nearly one-fourth (116 acres) of the aquatic habitat present in pool 1 could be dredged over the next 40-years under both the GREAT I and CMMP. In contrast, while dredging in many other pools could impact greater than 50 percent of the main channel habitat under either plan, dredging generally would disturb less than 10 percent of the total aquatic habitat present in most pools.

Placement of dredged material results in invasive and long-term conversion of the existing habitat of a site to relatively barren, unproductive sand. The specific impacts on fish and wildlife are largely related to the conditions present before material placement. For those sites with a climax vegetative communities, the conversion to sand barrens can have substantial impacts on fish and wildlife usage of the site. For sites previously disturbed by human activities, the impacts on fish and wildlife usage are negligible or minor. Placement of dredged material results in permanent changes in habitat type and usage by fish and wildlife species.

Table 5-6 provides comparisons of the impacts of the GREAT I and CMMP plans on wetland, disturbed floodplain and upland habitats. Acreage estimates provided in Table 5-6 were obtained from Olson and Meyer (1976). Placement of dredged materials at the sites selected under the CMMP would adversely impact approximately 213 acres of wetlands, 292 acres of disturbed floodplain and 360 acres of upland. Comparative figures for the GREAT I plan include 477 acres of wetland, 281 acres of disturbed floodplain and 361 acres of upland. Approximately 123,705 acres of wetlands, 4,200 acres of disturbed floodplain and 50,988 acres of upland are present within the St. Paul District's portion of the UMR and the navigable portions of the Minnesota and St. Croix Rivers. Under the CMMP, approximately 0.2 percent of the wetland habitat present would be essentially converted to an upland habitat. Under the GREAT I plan, approximately 0.4 percent of the wetland habitat present would be converted to an upland habitat. Both plans would have substantial impacts on wetland habitats. Comparatively, the CMMP would convert substantially fewer acres of wetlands to upland and overall would affect fewer total acres. Both plans would have substantial impacts on upland habitats. For example, 8.8 percent and 5.0 percent of the upland habitat in pool 1 would be affected by dredge material placement under the GREAT I and CMMP, respectively. However, pool 1 has a narrow floodplain with little upland habitat. Additionally, most of the upland habitat located within pool 1 is of low quality, having been previously disturbed by industrial/commercial development. A substantial area of disturbed floodplain habitat would be affected under both the CMMP (7.0 percent) and GREAT I (6.7 percent) plans (Table 4-1). From an ecosystem basis, the impacts of both the CMMP and GREAT I plans on biological productivity and habitat diversity and interspersion would be minor (Tables 5-3 and 5-4). However, on a local or in some cases regional basis, the impacts would be significant. Specific examples follow.

Table 5-6. Comparison of the impacts of the GREAT I and CMMP on wetland and upland habitats.

Pool	Total Wetland (acres)*	Total Disturbed Floodplain (acres)*	Total Upland (acres)*	Wetland Placement (acres)		Percent of Wetland Acres Affected		Disturbed Floodplain Placement (acres)		Percent of Disturbed Flooplain Acres Affected		Upland Placement (acres)		Percent of Upland Acres Affected	
				GREAT	CMMP	GREAT	CMMP	GREAT	CMMP	GREAT	CMMP	GREAT	CMMP	GREAT	CMMP
Minnesota	5,192	64	4,562	39.5	7.0	0.8%	0.1%	0.0	0.0	0.0%	0.0%	50.5	16.0	1.1%	0.4%
St. Croix	405	96	546	35.5	0.0	8.8%	0.0%	46.5	11.0	48.4%	11.5%	1.5	0.0	0.3%	0.0%
USAF & LSAF	no data	no data	no data	0.0	0.0	0.0%	0.0%	0.0	0.0	0.0%	0.0%	10.0	7.0	no data	no data
Pool 1	14	59	40	0.0	0.0	0.0%	0.0%	22.0	9.0	37.3%	15.3%	3.5	2.0	8.8%	5.0%
Pool 2	4,337	267	6,102	49.5	49.0	1.1%	1.1%	0.0	18.0	0.0%	6.7%	65.9	31.0	1.1%	0.5%
Pool 3	10,471	193	4,296	91.5	24.0	0.9%	0.2%	11.0	6.0	5.7%	3.1%	18.5	56.0	0.4%	1.3%
Pool 4	16,587	968	7,006	39.3	17.0	0.2%	0.1%	31.0	109.0	3.2%	11.3%	114.1	146.0	1.6%	2.1%
Pool 5	9,775	556	11,935	0.0	0.0	0.0%	0.0%	33.0	46.0	5.9%	8.3%	36.0	39.0	0.3%	0.3%
Pool 5A	6,809	373	907	47.0	25.0	0.7%	0.4%	18.0	18.0	4.8%	4.8%	0.0	0.0	0.0%	0.0%
Pool 6	7,666	246	3,424	9.0	8.0	0.1%	0.1%	7.5	3.0	3.0%	1.2%	0.0	6.0	0.0%	0.2%
Pool 7	8,701	272	2,758	33.0	11.0	0.4%	0.1%	9.1	12.0	3.3%	4.4%	1.7	0.0	0.1%	0.0%
Pool 8	15,302	490	3,491	37.0	17.0	0.2%	0.1%	74.5	31.0	15.2%	6.3%	4.0	11.0	0.1%	0.3%
Pool 9	23,819	423	2,707	75.2	46.0	0.3%	0.2%	28.0	19.0	6.6%	4.5%	11.1	23.0	0.4%	0.8%
Pool 10	14,627	193	3,214	20.7	9.0	0.1%	0.1%	0.0	10.0	0.0%	5.2%	44.0	23.0	1.4%	0.7%
Totals	123,705	4,200	50,988	477.2	213.0	0.4%	0.2%	280.6	292.0	6.7%	7.0%	360.8	360.0	0.7%	0.7%

* Acreage estimates obtained from Olson and Meyer (1976) and USACE (1983); see Table 4-1.

Under the GREAT I plan, the use of selected disposal sites for the St. Croix River would convert approximately 8.8 percent of the wetlands present along the St. Croix to upland habitats. Comparatively, the CMMP would convert no wetlands to upland, but would impact already disturbed floodplain habitat. In pool 2, both plans would convert 1.1 percent of the wetland present in the pool to an upland habitat. The GREAT I plan would have the greatest impact on wetlands, in terms of total acres, in pool 3, where 91.5 acres or 0.9 percent of the wetlands found in the pool would be converted to old dredged material/sand habitat. The CMMP would convert only 24 acres or 0.2 percent of the wetlands found in pool 3 to old dredged material habitat. The CMMP would have the greatest impact on wetlands, in terms of total acres, in pool 2 where 49 acres of wetland would be converted to dredged sand. The GREAT I plan for pool 2 would convert 49.5 acres of wetlands to old dredged material. Both the GREAT I plan and CMMP would affect the most total acreage (upland and wetland combined) in pool 4, where 183.4 acres and 272 acres, respectively, would be converted to dredged sand habitat over 40-years.

Section 4.0 (Tables 4-1 through 4-8) provides listings of State-protected species potentially found in the floodplain of the UMR within the St. Paul District's boundaries. A screening process, as outlined in Appendix G, was used in identifying the species listed in Section 4.0.

If individuals of State-listed species are present at the placement sites or within the dredge cuts proposed for use/maintenance under the CMMP, use of these sites could result in death of these individuals. This is especially true for less mobile species or life stages like plants, mussels, reptiles, amphibians, and eggs and young-of-year fish and birds. At this time, the District is not aware of any State-listed species present at the sites or dredge cuts proposed for use/maintenance in the CMMP. However, it is likely that at least some State-listed species do occur at some of the CMMP proposed placement sites/dredge cuts. Because there is no direct evidence to indicate the presence of State-listed species, a habitat-based assessment of the acres of different habitat types affected under the CMMP and the specific habitat requirements of State-listed species was completed to determine potential impacts (see Appendix G).

Dredging and dredge material placement could affect habitat for State-listed protected species. Acres of habitat impacted by dredging or placement of dredged materials would include:

2,988	acres of open water (main channel) habitat
39	acres of open water (main channel border and side channel) habitat
40	acres of type 3-4-5 (shallow and deep marsh) wetlands
134	acres of type 1-2 (floodplain forest, wet meadow) wetlands
5	acres of recreational beach/sand habitat
287	acres of old dredged material
6	acres of upland meadow/brush habitat
74	acres of agricultural field habitat
98	acres of disturbed terrestrial habitat
182	acres of abandoned quarry habitat

For the dredged material placement sites, the greatest potential for impacting State-listed species is on habitat types not previously disturbed by dredged material placement. For the previously disturbed areas, use of these sites under the CMMP would preclude the eventual reestablishment of vegetation and potential future use by State-listed species. The total acres of undisturbed habitat that would be impacted by dredged material placement compared to the total available habitat within the UMR corridor that could be utilized by State-listed species is very small. The impacts to potential habitats for State-listed species can only be viewed as negligible. The rarity of State-listed species decreases the likelihood they would utilize the proposed placement sites, but increases the importance of these sites if use by State-listed species does occur. Prior to the use of placement sites with undisturbed habitats, an on-site would be held and the State natural resource agencies present at the on-site should identify the potential for impacts and measures to avoid and minimize impacts on State-listed species.

Dredging primarily occurs in the main channel of the UMR, St. Croix or Minnesota Rivers. State-listed threatened, endangered or special concern mammal, bird, reptile, amphibian, and plant species typically do not utilize this habitat, as a result, dredging would have no affect on these species. Maintenance dredging and placement at aquatic sites, however, have the potential to affect State-listed mussel and fish species. Maintenance dredging will result in at least a temporary and periodic disturbance of a substantial portion of the available main channel habitat. Dredging frequently occurs at relatively unstable substrate areas, which probably limits the value of these areas for State-listed fish and mussel species. Benthic structure, such as sand waves or dunes, which could be utilized by State-listed lotic fish species, would be periodically destroyed. Because dredging results in only a short-term (3 to 4 days), periodic disruption to main channel habitat, the effect on State-listed lotic fish species is anticipated to be relatively minor. Dredging should have no effects on State-listed lentic fish species. Mussels have the ability to re-colonize a disturbed area. Dredge cuts that have a low frequency of maintenance, have not been dredged for a number of years, have good substrate conditions, and based on historical surveys have a reasonably diverse, abundant mussel assemblage; have the greatest potential to affect rarer mussels. The Federal Biological Assessment (Appendix C) lists the dredge cuts and placement sites with the greatest potential for affecting rarer mussels. These cuts will be surveyed prior to project implementation.

Harbor maintenance dredging occurs in open water areas with substantial amounts of disturbance (recreational or commercial navigation); areas not typically vegetated. Harbor maintenance dredging would have no effects on State-listed threatened, endangered or special concern animal and plant species.

5.1.3 Effects of Dredging and Dredged Material Placement on Federal Threatened and Endangered Species

Dredging has limited potential to affect the endangered species present in and along the UMR. Dredging activities could disrupt the feeding and roosting activities of peregrine falcons or bald eagles in the immediate vicinity of dredging operations. Additionally, dredging could result in

the direct removal of endangered mussels from the river. However, the Higgins' eye pearly mussel is not known to exist in the vicinity of any of the historic main channel dredge cuts.

The use of dredged material placement sites within proximity of bald eagle roosting, nesting and wintering areas could affect this species through disturbance of habitat usage.

Placement of dredged materials on upland placement sites would obviously kill any mussels contained within the dredged material through desiccation. Generally, however, use of upland placement sites would have little or no affect on freshwater mussels, including threatened and endangered species.

Use of temporary "bathtub" sites could affect endangered mussels through direct coverage. However, the likelihood of endangered mussels colonizing "bathtub" areas is quite low. Generally, the shifting sand substrates in these areas are poor habitat for freshwater mussels. Additionally, these areas are frequently disturbed either through placement of dredged materials, or excavation of materials during transfer operations.

In-water placement of dredged material (thalweg placement) could affect endangered mussel species through direct burial. Mussels buried by in-water placement of dredged material would likely perish as a result of asphyxiation and/or starvation. Although no permanent in-water placement of dredged material is proposed in the CMMP, in some instances, a temporary in-water rehandling site is required. In addition to the potential for burial, endangered mussels inhabiting rehandling sites could be dredged and deposited on upland locations, imminently leading to death.

A biological assessment (BA) of the impacts of the CMMP on threatened and endangered species has been completed and is included as Appendix C of this final EIS. The BA contains the St. Paul District's assessment of the potential effects of the CMMP on threatened and endangered species. Comments on the draft BA (provided in the draft EIS) were provided by the U.S. Fish and Wildlife Service (see U.S. Department of the Interior letter; Appendix F). Several screening criteria were developed to determine if dredging and placement activities might affect threatened and endangered species. The year a cut was last dredged and dredging frequency were used as primary factors in determining if dredging might affect a threatened or endangered mussel species. Substrate suitability and historic and recent mussel surveys were used as secondary factors in determining if dredging might affect threatened and endangered mussel species. Placement site characteristics; such as location of a site in relation to present distribution of mussels, proposed site use (mechanical or hydraulic disposal site) and site type (upland or wetland site), were used to screen placement sites for potential effects on threatened and endangered mussel species. Screening criteria for the potential effects of dredging on bald eagles included: frequency of maintenance of a dredge cut, location of nest sites in relation to cut location and location of a dredge cut in relation to centers of human activity. The following factors were considered in determining potential impacts of placement site use on bald eagles: how developed the site area was, the level of human activity in the site area, presence of nesting

activity within 0.6 miles of the site, presence of winter roosting site within site vicinity and presence of winter feeding areas near a site. Most of the activities associated with implementation of the CMMP were determined to have no effect on federally listed species. Activities that could affect Federally threatened and endangered species are summarized below.

- Any future thalweg in-water disposal sites
- Channel structure modifications
- Dredging of new sediment traps
- Channel width increases at:
  - Grey Cloud Slough (pool 2)
  - Boulanger Bend (pool 2)
  - Truedale Slough (pool 3)
  - Four-Mile Island (pool 3)
  - Head of Lake Pepin (pool 4)
  - Below Reads Landing (pool 4)
- Dredging new cuts and the following historic cuts:
  - Above 35W Bridge (MN River)
  - Four-Mile Cutoff (MN River)
  - Kinnickinnic Bar (St. Croix River)
  - Washington Avenue Bridge (pool 1)
  - Upper Approach to L/D 1 (pool 1)
  - Robinson Rocks (pool 2)
  - Prescott (pool 3)
  - Truedale Slough (pool 3)
  - Four-Mile Island (pool 3)
  - Trenton (pool 4)
  - Above Red Wing Highway Bridge (pool 4)
  - Below Red Wing Highway Bridge (pool 4)
  - Lower Approach to L/D 4 (pool 5)
  - Island 58 (pool 5A)
  - Fountain City (pool 5A)
  - Gravel Point (pool 6)
  - Richmond Island (pool 7)
  - Upper Approach L/D 7 (pool 7)
  - Sand Slough (pool 8)
  - Picayune Island (pool 8)
  - Deadman's Slough (pool 8)
  - Lower Approach L/D 8 (pool 9)
  - Twin Island (pool 9)
  - Battle Island (pool 9)
  - Hay Point (pool 10)
  - Mississippi Gardens (pool 10)
  - Jackson Island (pool 10)

Wyalusing (pool 10)

- o Dredged material placement at the following sites:
  - St. Paul Barge Terminal (pool 2)
  - Morgans Coulee (pool 3)
  - Red Wing Yacht Club (pool 4)
  - Colvill Park (pool 4)
  - Teepeeota Point (pool 4) - Future expansion of the containment site
  - Mississippi Gardens (pool 10)
  - In-water rehandling site (pool 10)
  - Wyalusing Beach (pool 10)
  - All NEW placement sites not covered in this document
- o Material placement, maintenance or development at 15 recreational beach sites
- o Snagging

Prior to implementation of these components of the CMMP, surveys and other pertinent information would be gathered for these activities to evaluate their potential impacts on federally listed species and identify appropriate avoidance measures. It is also recognized that the distributions of bald eagles, winged mapleleaf mussels, and Higgins' eye pearly mussels are likely to change in the future, which could change the determination of no effect. Reevaluation of parts of the channel maintenance plan will be done, as necessary, when new information is obtained indicating that a proposed activity could affect a threatened or endangered species.

No biological assessment has been completed for the actions proposed under the GREAT I plan. As a result a direct comparison of the effects of the two plans on threatened and endangered species cannot be made.

5.1.4 Effects of Dredging and Dredged Material Placement on the Upper Mississippi River National Wildlife and Fish Refuge (Refuge)

Main channel dredging in the Upper Mississippi River National Wildlife and Fish Refuge (Refuge) has very little effect on the refuge as a whole. However, some minor sediment movement into backwater areas may occur. The effects on fish and wildlife resources would be the same as those described in Section 5.1.2.

Many of the dredged material placement sites identified in the CMMP and GREAT I plans are located within the Refuge. As a result, the use of these sites would affect the resources of the Refuge in many of the same ways described previously in this document. The use of sites within the Refuge for dredged material placement commits these areas to maintenance of commercial navigation.

5.1.5 Effects of Dredging and Dredged Material Placement on Recreation Resources

Dredging activities can have short-term negative effects on recreation. Recreational boaters can be displaced by the dredging equipment and activities. Generally, the impacts are limited to inconveniences or short-term delays to recreational navigation in the area of the dredging operation. This effect may be most apparent on the St. Croix River where recreational traffic is heaviest. However, this impact is expected to be only short-term in nature while the dredging activity is ongoing. The only location on the St. Croix River currently maintained by dredging is at the Kinnickinnic River delta. Dredging is needed at this location about once every five years and takes about one to two weeks to complete.

The temporary or permanent placement of material in existing developed recreation areas, such as launching ramps, reduces the usability/capacity of the facility as long as the material is present. However, many of the dredged material placement sites provide excellent beach facilities which are heavily used by the recreating public. In addition, when dredged material is beneficially used to develop or improve recreational facilities, such as is proposed in the pool 9 plans for developing Blackhawk Park, the impacts on recreation can be substantial and beneficial.

5.1.6 Effects of Dredging and Dredged Material Placement on Archeological and Historic Resources

A number of archeological and historic resources are potentially located in the UMR channel and could be affected by dredging. These resources are related primarily to the UMR's use as a transportation corridor, such as submerged shipwrecks and structures associated with the lumbering industry. During the last part of the 19th century, the Beef Slough area at the mouth of the Chippewa River was one of the largest lumber booming works in the world. A detailed description of this historic context can be found in the archeological and historic portion of the Affected Environment section (Section 4.0) of this EIS.

Early dredging of the river, prior to construction of the locks and dams along the UMR, would have disturbed any cultural resources encountered. Today, most of the dredging work along the river is conducted in areas previously dredged. This work involves clearing sediment filled portions of the existing channel as they become an obstruction to navigation. This annual dredging of the existing river channel cuts has minimal impact upon archeological and historic resources within the channel areas. Efforts to identify and reduce dredging impacts to cultural resources have focused on impacts associated with the placement of dredged material in upland disposal areas where archeological and historic resources are located.

Over the past several years, more emphasis has been placed on the identification of submerged shipwrecks and the assessment of possible effects on these resources as a result of Federal projects. This effort is principally associated with passage of the Abandoned Shipwreck Act of 1987. Over the past decade, two historic shipwrecks have been considered in permit actions

conducted under the Department of the Army's permitting authority. Both of these shipwrecks, the WAR EAGLE in the Black River and an unnamed vessel in the East Channel at Prairie du Chien, are adjacent to or in the main navigation channel.

Underwater investigations conducted by the St. Paul District on the WAR EAGLE confirmed that dredging in the 1940's resulted in the loss of a large portion of this 219-foot vessel. The remaining portion of the vessel has been determined eligible for the National Register of Historic Places. This case shows that dredging may not destroy an entire vessel and that the remaining structure can be significant enough to merit inclusion on the National Register.

Clammers located an unnamed vessel in the East Channel at Prairie du Chien while working in this portion of the river. The site has been confirmed by the Wisconsin State Underwater Archeologist; however, little work has been done to identify the vessel.

In the process of updating the EIS for channel maintenance on the UMR, the St. Paul District completed a literature search and records review to identify possible shipwrecks along the river. The results of this work indicate that at least 46 steamers and many other vessels dating between 1853 and 1911 have sunk along the UMR, St. Croix and Black Rivers. This study has identified most of the shipwrecks that are known, from newspaper accounts and other sources, to have sunk along the river. The study also describes the historic context of these wrecks, including the situations that caused them. This knowledge will influence how the St. Paul District conducts studies in new dredge cuts that may have an impact on known vessels or others that sank without being recorded.

John Jensen, who conducted the shipwreck study for the District, has identified eight archeologically sensitive reaches in the District's portion of the upper Mississippi River. These reaches are:

River Miles 663 to 707 (La Crosse area).
River Miles 724 to 726 (Winona area).
River Miles 745 to 750 (West Newton Chute).
River Miles 758 to 764.6 (Wabasha\Reads Landing area).
River Miles 764.6 to 784.4 (Lake Pepin).
River Miles 810 to 815 (Hastings\Prescott area).
SCR Miles 0 to 23.5 (St. Croix River, Lake St. Croix)
River Miles 830 to 853 (Minneapolis\St. Paul area).

These are areas with one or more known wrecks and merit special attention. Other areas may also contain wrecks and should not be ignored or written-off. Before any new dredging takes place, especially in these areas, we must coordinate with the appropriate SHPO and take the steps necessary to determine whether we could affect the remains of any wrecks. Nineteen known wrecks occur within existing dredge cuts: 14 steamers and 5 barges.

The potential for finding the remains of a wreck in the main channel are small, given the intensity of channel improvement works since 1866. Channel constriction, dredging and wreck removal have undoubtedly destroyed many wrecks. Those that remain are of great historical value, even if significantly disturbed.

In 1975, the St. Paul District funded an archeological survey for all dredged material placement sites along the UMR within the District. Three contracts were awarded for various portions of the river.

> Archaeological Survey of 1975 Season Dredge Spoil Deposit Sites in Mississippi River Pools USAF, 1, 2, 3, 4, and 5. The Science Museum of Minnesota.
>
> An Archeological Survey of the Mississippi River 9' Channel: 1975 Dredge Placement Sites, Pools 5A, 6, 7, and 8. The State Historical Society of Wisconsin.
>
> Upper Mississippi River Dredge Placement Survey and Testing: Pools 9 & 10. Luther College Archaeological Research Laboratory.

This effort did not result in the location of any new archeological sites, primarily because the survey work was to focus on placement sites where dredged material had already been placed. While most of the three investigations attempted to conduct some limited subsurface testing in areas adjacent to the existing placement areas, the sporadic and non-intensive nature of this work makes these surveys of limited value today.

Since the 1975 survey, archeological survey work along the UMR has been scattered. The most comprehensive survey work has been conducted in upper pools 4, 7, and 10. Other pools along the river have been subjected to archeological surveys as needs for individual projects arise. This work is usually very site-specific and is beneficial for channel maintenance work only when the project areas overlap.

Some survey work has been done at specific sites scheduled to be used for dredge material placement. Because these placement sites have been surveyed prior to use, the surveys have been much more effective in locating archeological resources. For example, in 1985, the St. Paul District contracted with the Mississippi Valley Archaeology Center at the University of Wisconsin-La Crosse to conduct surveys of two proposed placement sites in Pierce County, Wisconsin (Site 3.10) and Wabasha County, Minnesota (Site 5.24). This survey work identified two prehistoric sites that were tested in 1989 by archaeologists from the St. Paul District (O'Mack & Withrow, 1989: Report of Investigations No. CENCS-PD-ER-35).

The large-scale, comprehensive survey efforts conducted in pools 4, 7, and 10 have also included detailed geomorphological work that helps guide future archeological surveys and at times obviates the need for further survey work altogether. This is the case in upper pool 4 where geomorphological study suggests those islands between Red Wing and the head of Lake Pepin

have only been formed within the last 1,500 years. Geomorphological and archeological testing in this area confirmed through soil sampling and radiocarbon dating that these islands were recently formed as sediment filled in the upper portions of Lake Pepin. The only prehistoric sites located as a result of this work were sites associated with Lake Pepin rather than the river.

In pool 7, geomorphological and archeological survey work suggests a thick mantle of post-settlement alluvium covers much of the lower part of the pool. Archeological sites are present, in abundance, on the three UMR terraces located in the La Crosse, Wisconsin, area, but few prehistoric remains have been located on floodplain islands below the elevation of the lowest of the three terraces. The vast quantity of post-settlement alluvium in this area is likely associated with soil loss resulting from deforestation in the mid-1800's, when the lumbering industry was active in the Black River pineries of central Wisconsin. The wide extent of the UMR in this area has allowed the Black River to build an extensive delta into its course. Any archeological sites on the pool 7 floodplain around the Black River are likely buried by this thick cover of post-settlement alluvium. Therefore, future dredged material placement sites located in these areas have little chance of significantly affecting archeological sites.

The large number of prehistoric sites in pool 10 and their association with specific geomorphological units have helped to focus archeological survey work and specifically identify dredged material placement areas that need a further intensive survey. Other geomorphological units, such as mid-channel islands, have little potential for the location of archeological sites, and placement sites in these areas have been approved with no further survey work needed.

Future survey work in other pools of the UMR would benefit greatly from the more comprehensive approach given to pools 4, 7, and 10. A more comprehensive approach would help justify the needs for surveys at specific sites and would eliminate surveys in areas where limited potential for locating archeological resources exists.

Overall, cultural resources work would need to be completed on many of the proposed sites under both the CMMP and GREAT I plans. Without completion of this work, comparing the impacts of the two plans on cultural resources is difficult. However, some important observations about the amount of work needed to complete Section 106 requirements can be made.

<u>St. Croix River</u> - All sites under both plans would need to be coordinated with the appropriate State SHPOs; however, the likelihood of impacts to cultural resources under either plan is low. Overall, the CMMP calls for fewer acres, but until more is known about the land to be affected, a final assessment of which sites would be better cannot be completed.

<u>Minnesota River</u> - The literature search and records review for submerged shipwrecks did not include that portion of the 9-foot navigation channel along the Minnesota River. Dredging to maintain existing channels should be reviewed to consider the potential for unknown shipwrecks along the Minnesota River. While many of the sites above would probably not affect cultural

resources, all selected sites in the Minnesota River pool should be coordinated with the Minnesota SHPO. Any currently approved site that the District plans to expand would have to be coordinated with the SHPO as well.

Upper St. Anthony Falls - Use of the proposed sites would have no effect on cultural resources but require coordination with the Minnesota SHPO. One site falls under the CMMP and one under GREAT.

Pool 1 - The Minnesota SHPO has approved using all of the sites. Expansion beyond the boundaries of any previously used site or beyond the previously used portion of any site would require coordination with the Minnesota SHPO. As the SHPO has approved all the sites, there is no significant difference between the CMMP and GREAT plans.

Pool 2 - Only three sites, 2-836.3-RMP (2.13; Southport), 2-836.8-RMP (2.14; Holman Field) and 2-821.0-LMP (2.35), have been approved by the MNSHPO for use. Southport and Holman Field are recommended/selected under both the CMMP and GREAT I plan for the same number of acres under each. Site 2-821.0-LMP (2.35) is recommended under the GREAT I plan. Until all other sites have been coordinated, a reasonable comparison of alternatives cannot be made. While more of the GREAT sites have been cleared by the SHPO, the CMMP sites would not require much more work to gain approval. In fact, the surveys requested by the SHPO for the CMMP sites may not be needed. The potential for affecting cultural resources at these sites is low. Overall, the number of acres required under each alternative is not significantly different.

Pool 3 - Two of the 9 GREAT sites have been approved. Three will require archeological survey work and 7 of 9 (including the one to be surveyed) will require coordination. Two of the 10 CMMP sites have been approved. One site requires survey work and coordination and 7 other sites require coordination. To compare the effect on cultural resources of the two plans would require completing the surveys for the GREAT and CMMP sites.

Pool 4 - The SHPOs have approved 12 of the 15 GREAT sites and 8 of the 13 CMMP sites. Of the remaining GREAT sites, 2 require further survey work, and of the remaining CMMP sites, 1 requires further survey work. One GREAT site and 4 CMMP sites require initial coordination. Until the survey work is completed, we cannot compare the two plans for their effects on cultural resources. The amount of work needed to complete the cultural resources review will depend on the results of the survey work and additional coordination.

Pool 5 - Other than Site 5-749.8-RMP (5.24; West Newton Chute), which is proposed under both plans, there is little difference between the GREAT I and CMMP plans and potential effects on cultural resources. Site 5-749.8-RMP has the potential for a National Register of Historic Places site and must be carefully evaluated.

Pool 5A - It is unlikely that use of any sites would affect cultural resources under either the GREAT plan or the CMMP. Site 5A-738.2-RMP (5A.36; L/D 5 Site) would require

coordination. The lands around this site were probably disturbed during construction of the lock and dam.

Pool 6 - In each case, 2 of the 3 dredge disposal sites will require further coordination, and in each case, the likelihood of finding cultural resources is small. While we need to complete the coordination to make our final determination, it appears that neither plan would significantly affect cultural resources.

Pool 7 - Although the SHPO approved the use of Sites 7-714.1-LWP (7.06; Trempealeau) and 7-713.1-RMP (7.05; Hot Fish Shop), the fish ponds at these sites were not evaluated. Given the significance of the fishponds at Guttenberg, Iowa, these ponds should be evaluated. The GREAT alternative calls for using many more acres for each site, and if the ponds are significant, this could be an important difference. Given the potential for cultural resources associated with early lumbering, further survey work has been recommended for Site 7-707.3-RMP (7.25A; Dakota Boat Ramp), a CMMP site. The outcomes of the additional reviews called for above will determine which alternative is better from a cultural resource perspective.

Pool 8 - All three sites have been approved for use under the CMMP. All but one of the GREAT sites have been approved. Site 8-684.7-LWP (8.22; Stoddard) would have to be surveyed. As cultural resources have been found at this disposal site, the CMMP would have less impact on cultural resources.

Pool 9 - All the CMMP sites have been approved, although Site 9-670.5-LWP (9.55; Blackhawk Park) has been conditionally approved only. Any proposed work at this site that goes below the level tested in 1982 would require a survey and cultural resources evaluation. Four of the 13 GREAT sites will require further coordination and possibly a survey. Since the CMMP would affect fewer acres and all the sites have been approved, the potential to affect cultural resources is less. However, surveys could reveal that the GREAT sites have no cultural resources as well. At this point, all we can say is that the CMMP would require less cultural resources review and all the sites have been approved.

Pool 10 - Because of the high potential for archeological sites being located in pool 10, both plans would require further archeological survey work and cultural resource coordination. Under the CMMP, four sites would require survey work and two would require coordination to finalize approval. Given previous work on the latter two sites, approval should be forthcoming. Under GREAT, six sites would require survey work and one would require coordination to finalize. Overall, the GREAT plan, with the survey work required for site 10-646.5-LWP (10.16; Gordon's Bay Landing), would require more cultural resource work, but the potential to have an effect on cultural resources cannot be determined without further analysis.

5.1.7 Effects of Dredging and Dredged Material Placement on Socioeconomic Resources

Dredging has significant positive effects on socioeconomic resources in that it is necessary to maintain commercial navigation and all of the economic benefits that accrue from commercial navigation. However, aside from that aspect, the actual dredging itself has little socioeconomic effect. For the most part, dredging takes place in a relatively isolated environment from a socioeconomic perspective. The effects are generally limited to inconveniences or minor, short-term delays to commercial and recreational navigation in the area of the dredging operation. Advance notice of the timing and location of dredging is generally provided to the barge industry so that they can adjust their operations to minimize the impacts of delays caused by necessary dredging. Traffic levels are not of sufficient magnitude to cause lengthy queues during dredging activities.

The economic benefits of maintaining the 9-foot channel project are significant. The navigation channel offers a competitive alternative for long-haul movements of bulk commodities. A recent study conducted as part of the ongoing Upper Mississippi River - Illinois Waterway Navigation Study has identified transportation cost savings for typical barge movements ranging up to \$35.00 per ton versus the least costly alternative. Average savings amount to about \$9.00 per ton. During a typical navigation season in the St. Paul District, the navigation system generates transportation cost savings benefits on the order of \$150 to \$200 million.

To attain these benefits, the infrastructure must be operated and maintained. For FY 1997, funding to operate and maintain the Mississippi River project in the St. Paul District amounts to \$42,346,000. Of this, \$14,998,000 is scheduled for lock maintenance, \$15,019,000 for lock operations, and \$9,476,000 for channel maintenance. These figures are considered fairly representative of annual expenditures. Major maintenance and major rehabilitation projects are included in the lock maintenance category and dredging is included in the channel maintenance category. These expenditures are funded by the Federal government.

Both plans would result in maintenance of the project. As a result, the benefits of maintaining the 9-foot channel project under either plan do not provide a tool for comparison of the plans. However, because fewer cuts are considered active under the CMMP, the cost of dredging under this plan would be less than under the GREAT I plan.

Depending on site access, as much as 100 percent of dredged material placed at placement sites is beneficially used by local interests for construction, road sanding or fill activities associated with development. Dredged material can be a substantial resource for communities along the river. The use of dredged material benefits communities that otherwise would have to purchase material from other suppliers.

Site-specific effects on economic and social resources from placement range from slightly negative effects to significantly positive effects. Operation of a dredged material placement or stockpile site in or near a residential area creates a number of social concerns, including noise,

increased local road maintenance, and reduced visual qualities. In addition, dredging and disposal can conflict with recreational use. In contrast to the minor negative social impacts, dredging to maintain the navigation channel has significant positive impacts. The recommended plan provides for active beneficial use of approximately 16.77 million cubic yards of dredged material, or 52 percent of the projected total (31.97 million cubic yards) over the next 40 years. Additionally, approximately 8.2 million cubic yards (26 percent) would be used in a passive beneficial use manner (i.e., construction of islands as part of Weaver Bottoms Rehabilitation, park development at Blackhawk Park, and other in floodplain uses). Comparative figures for active beneficial use under the GREAT I plan are 16.33 million cubic yards, 45 percent and 36.42 million cubic yards.

Aspects of both plans are controversial. However, the GREAT I plan has been previously approved for implementation. As a result the level of controversy associated with the GREAT I plan is minor. The CMMP represents a further refinement of the GREAT I plan and has incrementally lesser environmental impacts and costs, therefore, the CMMP should have a similar but slightly lesser level of controversy.

5.2 ENVIRONMENTAL EFFECTS OF CHANNEL STRUCTURES

Channel training structures affect the river at four different spatial scales. These are the local scale (e.g. near the training structure), the river reach scale (e.g. typically a 2 to 10 mile river reach with interdependent hydrodynamics), the navigation pool scale, and the floodplain scale (e.g. multiple pools).

On a local scale, the hydrodynamics around training structures are complex. A scour hole usually develops at the tips of wing dams and at notches in closing dams. Sediment accretion occurs between wing dams and adjacent scour holes. Many training structures provide local diversity and habitat (Pitlo in Burch et al. 1984), although sedimentation behind wingdams can adversely affect main channel border habitat.

On a river reach scale, the effects of training structures on river planform vary depending on depth of inundation. Nanda and Baker (1983) report that adequate training structures, submerged 3 to 5 feet below low water surface elevation, are effective. Generally, this means in the upper and middle reaches of pools, training structures continue to affect reach specific hydrodynamics and sediment transport. In the lower pools, training structures are more deeply submerged, and are less effective. If wing dams are submerged to the point where about 30-percent of the total main channel flow is conveyed over them, they are ineffective. In many instances, lower pool structures are buried in sediment, which likewise reduces their effectiveness.

On a navigation pool and floodplain reach scale, the effects of training structures are minimal for existing river conditions. River character at these scales is dominated by manmade features such as locks and dams and agricultural or flood control levees, post glacial river valley planform, and tributary locations.

Channel structure modifications are designed to concentrate flows in the main channel and therefore primarily affect flow patterns along with sedimentation patterns. Construction of new channel control structures and/or maintenance/rehabilitation of existing structures would involve covering benthic habitat and could therefore have an impact on threatened and endangered mussel species. The general impacts of wing dam construction/rehabilitation, closing dam construction/rehabilitation and shoreline riprapping are described below.

Wing dams would be constructed/rehabilitated in main channel and channel border habitats. Increased current velocities and thus increased scouring of main channel areas in the vicinity of constructed/rehabilitated wing dams would occur, resulting in increased channel depths and/or widths. Sedimentation patterns would be changed, with sediment transported through rehabilitated river reaches to downstream areas of lower velocity. Habitat diversity and interspersion would be affected.

Closing dams would be constructed to reduce flows into side channel areas. Primary impacts such as reduced volume of flow, reduced current velocities, reduced sediment input, and

increased water residence time in backwaters would occur in these habitats and could affect fish and wildlife species in side channel areas. The increased flows in the main channel resulting from side channel closure would have an impact on main channel and channel border habitats as well.

Placement of stone protection on shoreline areas or wing dams covers benthic habitats and organisms.

Removal of channel control structures is also a possibility under the channel management program. Removal of channel control structures would result in many of the opposite impacts described above.

Channel structures would not be employed by the St. Paul District on the St. Croix or Minnesota Rivers to maintain the navigation channel. Therefore, there would be no effects on the St. Croix or Minnesota Rivers. Dredging and channel control structures are used to some extent for harbor maintenance by private groups. A private company on the Minnesota River is presently proposing to use control structures to reduce future harbor maintenance.

Table 5-7 provides a qualitative assessment of the impacts of the channel structure program on various resources. Because the channel structure program as defined under the CMMP is an extension of a GREAT I recommendation, the impacts of channel structure maintenance/construction under both the CMMP and GREAT I would be identical.

5.2.1 Effects of Channel Structures on Water Quality

Channel structures would be designed and employed to reduce main channel dredging requirements. Reduced dredging would also reduce the effects on water quality due to dredging and dredged material placement. Subsequently, construction/rehabilitation of channel structures should have an overall positive effect on the water quality of the UMR. However, where sediment contamination is a concern, construction of channel structures could result in relocation of contaminated sediments to other areas. Hydraulic modeling to evaluate the fate of sediments mobilized as a result of channel structure construction would be used to ensure structure modifications minimize impacts on water quality. No effects on groundwater should occur with any proposed structural modifications.

5.2.2 Effects of Channel Structures on Fish and Wildlife Resources

The goals of the channel structure program are focused on strategically using the hydraulic capabilities of the UMR to move sediment to locations where it can more easily be removed from the system through dredging and/or can create habitat diversity through delta formation, island building, etc. The effects of increased habitat diversity and interspersion on fish and wildlife would generally be positive. The reduced costs associated with dredging and dredged material

Table 5-7. Environmental assessment matrix (Section 122 of the River and Harbor and Flood Control Act of 1970 [P.L. 91-611]), channel control structures program under the CMMP and GREAT I plans.

	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels				X			
2. Aesthetic Values					X		
3. Recreational Opportunities					X		
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use				X			
10. Controversy					X		
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services		X					
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply			X				
8. Commercial Navigation		X					
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat				X			
3. Wetlands				X			
4. Aquatic Habitat		X			X		
5. Habitat Diversity and Interspersion		X			X		
6. Biological Productivity		X			X		
7. Surface Water Quality				X			
8. Water Supply				X			
9. Groundwater				X			
10. Soils				X			
11. Threatened or Endangered Species				U*			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

placement would also be positive. However, in most circumstances intentional construction of structures to move sediment from one location to another would have both positive and negative impacts. Reducing flows to backwater areas through construction of channel closures would potentially prolong deep water habitats present in backwaters, but would slow the succession of aquatic to wetland to terrestrial habitats which produces habitat diversity and interspersion. Conversely, building structures or opening up closures to encourage sedimentation and delta formation in pool areas which lack bathymetric diversity would increase the rate of habitat diversification. Sedimentation in backwater areas is generally detrimental to fishes, while delta formation is generally beneficial to waterfowl, furbearers, shorebirds etc. While, the channel structures program for the most part would provide benefits to fish and wildlife some tradeoffs or adverse impacts are also likely to occur.

Reduced dredging due to the construction of channel structures could affect both the fish and wildlife resources of the UMR. Wing dams and other in-water structures could provide improved habitat for fish by providing areas of reduced flow, a more diverse substrate, and additional cover. In addition, they could provide more suitable substrate for a wide variety of benthic organisms. However, during construction, the disturbance associated with placement of rock, sand or other construction materials would temporarily displace aquatic species from project locations. Reducing the requirements for dredged material placement sites could have positive impacts for wildlife, in that conversion of both upland and wetland habitats to dredged sand uplands through dredged material placement would be reduced.

In some circumstances the removal of channel control structures may be deemed desirable for improving fish and wildlife habitats. Removal of closing dams or wingdams could increase discharges to backwaters or side channels improving both chemical (primarily dissolved oxygen) and physical conditions in these areas.

Section 4.0 (Tables 4-1 through 4-8) provides listings of State-protected species potentially found in the floodplain of the UMR within the St. Paul District's boundaries. A screening process, as outlined in Appendix G, was used in identifying the species listed in Section 4.0.

The construction of channel training structures has the potential to affect State-listed species. During the reach-specific planning effort proposed under this program, potential impacts and means to mitigate will be identified and included in appropriate NEPA documents.

5.2.3 Effects of Channel Structures on Federal Threatened and Endangered Species

Channel structures would generally be constructed outside the main channel of the river. Some of these areas could be inhabited by the endangered Higgins' eye pearly mussel (*Lampsilis higginsi*). Prior to construction, any areas suspected of being able to support this mussel would be surveyed. If any specimens were discovered, the appropriate authorities would be notified and measures would be taken to insure the mussels would not be harmed.

Removal of channel structures could also potentially affect threatened and endangered species both directly and through habitat disturbance.

Appendix C provides the St. Paul District's assessment of the potential effects of channel structures construction on Federal threatened and endangered species. Construction of channel structures could affect threatened and endangered species. As project specific plans for channel control structures are completed, preparation of appropriate NEPA documents and consultation with the USFWS would be required to ensure Federally threatened and endangered species are protected.

5.2.4 Effects of Channel Structures on the Upper Mississippi River National Wildlife and Fish Refuge (Refuge)

Both the construction and potential removal of channel structures could have generally positive effects on the fish and wildlife resources found on the Upper Mississippi River National Wildlife and Fish Refuge. The benefits realized would be the same as those described in Sections 5.2.1 through 5.2.3 above.

5.2.5 Effects of Channel Structures on Recreation Resources

The continued maintenance/construction of channel structures would have minor to negligible impacts on recreation and the aesthetic environment. Construction of side channel closures could affect recreational access to backwaters, however, consideration of the need for recreational access would be included in development of any plans to build or rehabilitate channel structures. In general, all structures would be constructed to ensure recreational access would be maintained.

Removal of channel structures would also have negligible impacts on recreation. For the most part, access to backwaters would not be improved by removal of channel control structures.

5.2.6 Effects of Channel Structures on Archeological and Historic Resources

Channel structures would be designed and employed to reduce main channel dredging requirements. Impacts associated with channel structures, such as wing dams, are usually less severe than those associated with dredged material because the structures affect a substantially smaller area. However, they do have a potential to affect in-water resources such as sunken shipwrecks and other historic resources associated with river navigation.

To compare the benefits to cultural resources of channel structures and dredging, we would have to compare the location of the channel structures to the location of the dredged material placement sites on a case-by-case basis. Unless we know the exact number of wing dams and closing dams as compared to dredged material placement sites, we cannot make a fair comparison. In addition, shore protection needed in association with channel control structures could affect cultural resources. These areas would have to be evaluated also.

5.2.7 Effects of Channel Structures on Socioeconomic Resources

The proposed channel structures program would have both positive and negative effects on the human environment. Evaluating social effects requires consideration of the ways in which channel structure rehabilitation or construction would interact with the human environment; primarily navigation, public health and safety, and aesthetics. By reducing dredging requirements, improving flow characteristics and generally increasing the reliability of the 9-foot channel, the channel structures program would have substantial positive effects on commercial navigation and public facilities and services and minor beneficial effects on public transportation. During construction, some minor adverse impacts on aesthetic values would be realized as a result of the presence and operation of construction equipment. Above water portions of channel structures, where the structures are tied into shorelines, and riprap armoring would detract from the visual aesthetics of the area. However, the long-term negative effects on the visual environment would be minor.

5.3 ENVIRONMENTAL EFFECTS OF SNAG REMOVAL

Maintenance of the navigation channel includes authority to remove snags impeding or adversely affecting navigation. On the UMR, snag removal is rarely required because of the depth and size of the river.

On the St. Croix River below Stillwater, Minnesota, snag removal requirements are essentially nonexistent because of the water depths and water body size. Above Stillwater, up to the head of the 3-foot navigation channel at river mile 51.8, snag removal is occasionally required to maintain the channel for recreational boat passage. Snag removal on this portion of the St. Croix River is only pursued at the request of the National Park Service. Snags are usually dragged off the channel and left in a location where they can continue to provide habitat for fish and/or wildlife, depending upon the situation. Since establishment of the Lower St. Croix National Scenic Riverway in 1972, snag removal has been accomplished only in 1991 when the National Park Service requested several snags be removed from a single location.

On the Minnesota River, snag removal is performed more frequently because of a narrower channel and a greater incidence of trees falling into the river from eroding banks. Snags are cleared to the head of the 4-foot navigation channel at river mile 25.6 near Shakopee, Minnesota. On the Minnesota River, snags are usually placed on the riverbank near the removal site. Typically, snagging operations are required every 2 years, where 15 to 20 snags at 7 or 8 locations are removed.

There are 3 general alternatives for snag placement: 1) drag the snag out of the channel and leave it in the water (current practice with most snags on the UMR and St. Croix River); 2) remove the snag from the channel and place it on the riverbank out of the water (current practice on the Minnesota River and on occasion on the other two rivers); and 3) remove the snag from the channel and haul it to an on-land collection point for placement such as burning or landfilling (rarely done under current practices).

Table 5-8 provides a qualitative assessment of the impacts of snagging on various resources. Because snagging as proposed under the CMMP is an extension of a GREAT I recommendation, the impacts of snagging under both the CMMP and GREAT I would be identical.

5.3.1 Effects of Snag Removal on Water Quality

Removal of snags from the main channel of the UMR, St. Croix and Minnesota Rivers would have no adverse effects on water quality. While some disturbance of bottom substrates is likely during snag removal, the turbidity and/or suspended solids generated from this activity would be short-term in nature and have a negligible impact on water quality. Snag removal should have no effects on groundwater quality.

Table 5-8. Environmental assessment matrix (Section 122 of the River and Harbor and Flood Control Act of 1970 [P.L. 91-611]), snagging under the CMMP and GREAT I plans.

PARAMETER	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE EFFECT	ADVERSE EFFECT		
	SIGNIFICANT	SUBSTANTIAL	MINOR		MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels				X			
2. Aesthetic Values					X		
3. Recreational Opportunities			X				
4. Transportation			X				
5. Public Health and Safety			X				
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use				X			
10. Controversy				X			
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services				X			
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply				X			
8. Commercial Navigation			X				
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat				X			
3. Wetlands				X			
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity				X			
7. Surface Water Quality				X			
8. Water Supply				X			
9. Groundwater				X			
10. Soils				X			
11. Threatened or Endangered Species				U*			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

5.3.2 Effects of Snag Removal on Fish and Wildlife Resources

Although snag removal is only rarely required on the UMR, the removal of snags from the navigation channel could have both positive and negative impacts. Snag removal from the river could eliminate habitat structure beneficial to fish and other aquatic organisms. On the other hand, placing snags on the riverbank could provide beneficial effects by providing additional habitat for wildlife. The following summarizes the general effects of the three placement methods considered for use.

Placement Method	Aquatic Habitat	Terrestrial Habitat	Erosion Control
Leave in water	minor beneficial	no effect	minor beneficial
Place on bank	minor adverse	minor beneficial	minor beneficial
On-land placement	minor adverse	no effect	no effect

Snag removal in the St. Croix River is rarely required in the lake-like portion of the river below Stillwater, Minnesota. However, snag removal is occasionally required above Stillwater to the head of the 3-foot navigation channel. The effects of snag removal on fish and wildlife would be the same as those described above.

Snags are more common on the Minnesota River than on either the UMR or the St. Croix River and are an important habitat feature providing cover and velocity shelters for fish, sunning sites for turtles, feeding and resting platforms for furbearers and waterfowl and general habitat diversity. Snags are cleared all the way to the head of the 4-foot navigation channel at river mile 25.6 near Shakopee, Minnesota. Snags removed from the Minnesota River are usually placed on the riverbank near the removal site. While the effects of snag removal would generally be the same as those discussed above, the importance of snags and the habitat they provide to fish, turtles, furbearers and other aquatic species is somewhat greater on the Minnesota River than on the UMR or St. Croix. The removal of 15 to 20 snags at 7 or 8 locations every two years represents a substantial adverse impact on the cover and resting habitat provided by this resource.

While snagging may result in substantial impacts on the Minnesota River, overall the program has only minor impacts on fish and wildlife habitats (Table 5-8). The removal of snags from the river and placement either in the water, on the bank, or at on-land placement sites would have a very minimal impact on State-listed animals and plants (see Appendix G).

5.3.3 Effects of Snag Removal on Federal Threatened and Endangered Species

Removal of trees or other obstructions from the navigation channel could affect threatened mussel species through disturbance of bottom substrates and the threatened bald eagle (*Haliaeetus leucocephalus*) through removal of feeding perches. Two endangered species, the Higgins' eye pearly mussel (*Lampsilis higginsi*) and the winged mapleleaf mussel (*Quadrula fragosa*) are known to inhabit the St. Croix River. The Higgins' eye pearly mussel is also known to inhabit the UMR. Appendix C provides the St. Paul District's assessment of the potential

effects of snagging on Federal threatened and endangered species. The majority of snagging occurs on the Minnesota River, which is outside the current range of the Higgins' eye pearly mussel and the winged mapleleaf mussel. Snagging on the Minnesota River would be unlikely to affect Federal threatened and endangered mussel species, however, it could affect the threatened bald eagle. Snagging is only conducted on the St. Croix River at the request of the National Park Service. Snagging on the St. Croix River could affect threatened and endangered mussel species and the bald eagle. Snagging on the UMR is only occasionally required, however, snagging could affect threatened and endangered mussel species and the bald eagle. Before a snagging project would be completed on the St. Croix, Minnesota or UMR, appropriate NEPA documents would be prepared and endangered species consultation would be initiated with the USFWS including an assessment of the impacts of the project on threatened and endangered species.

5.3.4 Effects of Snag Removal on the Upper Mississippi River National Wildlife and Fish Refuge and the Minnesota Valley National Wildlife Refuge

Snag removal would have the same effects on water quality, fish and wildlife habitats and threatened and endangered species as detailed in Sections 5.3.1 through 5.3.3 above.

The effects of snag removal on the Minnesota Valley National Wildlife Refuge would be the same as those discussed for water quality, fish and wildlife habitats and threatened and endangered species in Sections 5.3.1 through 5.3.3 above.

5.3.5 Effects of Snag Removal on Recreation Resources

Snags are part of a natural river environment. Snags provide for some fisheries habitat and limited fishing opportunities. However, from a recreational fishing standpoint, snag removal probably would not alter the fishing experience to any great extent.

Snags are hazards to recreational boating and navigation. The removal of snags would have minor benefits to recreational boaters. Snag removal would have very minimal impacts on the visual environment.

Snag removal is not required in that portion of the St. Croix River adjacent to Afton State Park. Therefore, there would be no effect on the park.

5.3.6 Effects of Snag Removal on Archeological and Historic Resources

Snag removal is only rarely required on the UMR. Removal of snags could affect archeological sites such as old docks and sunken wrecks into which the snag might float and become entangled. However, as discussed in Section 4.1.14.3.3 *River Improvement* the Corps cleared the main channel of any obstacles early on in development of the UMR for navigation. The likelihood of a snag becoming entangled in an underwater historical archeological site in the main channel is extremely remote. The greatest potential for underwater historical archeological

sites would be along the channel margins and in the backwaters, where snagging is typically not conducted.

Removal of snags from the river has the greatest potential for adversely affecting cultural resources sites when large on-land sites are selected to dispose of snags. These sites should be coordinated prior to use to insure that cultural resources are not affected.

Placing snags on riverbanks has little impact on archeological or historic resources. Were these snags placed directly on the shoreline of the river, they could increase erosion of cultural resources. However, these snags are placed from the water as far back into the woods as the equipment can reach.

Snag removal in the St. Croix River is rarely required in the lake portion of the river below Stillwater, Minnesota. However, snag removal is occasionally required above Stillwater to the head of the 3-foot navigation channel. The effects of snag removal on cultural resources would be the same as those described above.

Snags are more common on the Minnesota River than on either the UMR or the St. Croix River. Snags are cleared all the way to the head of the 4-foot navigation channel at river mile 25.6 near Shakopee, Minnesota. Snags removed from the Minnesota River are usually placed on the riverbank near the removal site. The effects of snag removal would be the same as those discussed above.

5.3.7 Effects of Snag Removal on Socioeconomic Resources

Snag removal on the UMR, St. Croix and Minnesota Rivers would not be expected to have any appreciable impact on socioeconomic resources. In that snagging helps to maintain a safe and reliable channel, some minor benefits to transportation, public health and safety and commercial navigation would be realized.

5.4 ENVIRONMENTAL EFFECTS OF RECREATIONAL BEACH DEVELOPMENT

Dredged material can be used to maintain or create beaches for recreational use on the UMR. These beaches are popular with recreationists, but if improperly conducted, beach maintenance or creation can have adverse effects on natural resources. The St. Paul District is in the process of developing recreational beach development plans for each navigation pool on the UMR.

From a programmatic perspective, two alternatives are available: to continue to develop and eventually implement recreational beach development plans on the UMR; and to abolish the program of recreational beach development on the UMR.

Recreational Beach Development Program - Under this program, recreational beach development needs and sites would be identified, site plans developed, and dredged material used to create and/or maintain beach sites in accordance with the site plans.

No recreational beach development program would be implemented on the lower Minnesota River because it is not suited to this type of development. No program would be implemented on the St. Croix River, since the normal use of dredged material on the St. Croix River is for beach nourishment. Therefore, it is addressed under Section 5.1.

No Recreational Beach Development Program - Under this alternative, the St. Paul District would have no program to use dredged material for recreational beach development. Some dredged material would still be used on occasion for beach nourishment, but to a lesser degree than if a program were in place. There would be no plans for beach development, and in their absence, beach nourishment approval would be unlikely.

In addition, the general impacts of dredged material placement, discussed in Section 5.1, would also be common to recreational beach development placement sites.

Table 5-9 provides a qualitative assessment of the impacts of the recreational beach development program on various resources. Because the recreational beach development program, as defined under the CMMP, is an extension of a GREAT I recommendation, the impacts of recreational beach development under both the CMMP and GREAT I would be identical.

5.4.1 Effects of Recreational Beach Development on Water Quality

Beach nourishment and/or development could involve either hydraulic or mechanical dredging. Depending upon the specific site, some directional berming could be incorporated for routing of effluent. Turbidity and suspended solids would be expected to increase during dredged material placement. However, the material used for beach development would be medium to coarse sand which would quickly precipitate from the water column. Most of the sediment in areas where beach development would be anticipated is relatively clean and its use should have no appreciable adverse impact on water quality.

Table 5-9. Environmental assessment matrix (Section 122 of the River and Harbor and Flood Control Act of 1970 [P.L. 91-611]), recreational beach development under the CMMP and GREAT I plans.

	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE EFFECT	ADVERSE EFFECT		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR		MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels				X			
2. Aesthetic Values			X				
3. Recreational Opportunities		X					
4. Transportation				X			
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use				X			
10. Controversy				X			
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services			X				
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply				X			
8. Commercial Navigation				X			
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands				X			
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion				X			
6. Biological Productivity				X			
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils				X			
11. Threatened or Endangered Species				U*			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

The specific effects on water quality from beach development would have to be determined as specific beach development plans are considered. All recreational beaches are at or near the groundwater table and no effects on groundwater quality are anticipated.

5.4.2 Effects of Recreational Beach Development on Fish and Wildlife Resources

Approximately 57 sites have been identified and endorsed for recreational beach development (Table 5-10). Recreational beach maintenance plans for pools 7, 8, 9 and 10 have been developed and endorsed by the River Resources Forum. The actual area proposed for placement of materials for 26 of the sites remains to be determined by the On-Site Inspection Team. Site sizes have been identified for 26 sites. Five sites would be maintained in their existing condition without placement of dredged materials. For the sites with defined sizes the area impacted is normally less than 5 acres and usually only 1 or 2 acres. Nearly all sites identified for use are existing recreational beaches or previously used dredged material placement sites along the main channel. In total, 50 acres of dredged sand habitat with minor amounts of aquatic habitat would be affected at the sites with defined sizes. Assuming, the 26 sites with undefined areas would have approximately the same average sizes as those with currently defined areas it can reasonably be estimated that in total the recreational beach development program for the current stage of planning would affect 100 acres of mainly dredged sand habitat with very minor amounts of main channel border habitat. The effects on fish and wildlife would be minor.

The recreational beach development program would generally be focused on improving beaches which are currently used (some intensively) by the recreating public. Most of these areas are highly disturbed by human activities which tend to preclude or diminish use by fish and wildlife. Additionally, the habitat conditions (dredged sand) are not usually associated with diverse fish and wildlife assemblages. However, if not maintained as beach areas most of the sites would revegetate and eventually develop habitat characteristics similar to natural islands in the floodplain of the UMR. The maintenance of recreational beaches would have minor adverse impacts on fish and wildlife, however, the objective of the recreational beach program is to place materials at locations where the recreating public would benefit without significant impacts on other resources. By selecting sites which are already disturbed by human activities and past dredged material disposal, the impacts of recreational beach development on fish and wildlife, including State-listed species, would be minimized.

Placement of dredged materials on upland recreational beaches would have negligible impacts on State-listed species. The planning process outlined in the CMMP for evaluating recreational beaches includes extensive review opportunities for State natural resource management agencies. As site specific plans are developed, review by State natural resource agencies should identify the potential for impacts on State-listed species. If and when, potential impacts are identified, appropriate measures to avoid and minimize these impacts could be included in the planning process.

5.4.3 Effects of Recreational Beach Development on Federal Threatened and Endangered Species

Beach development plans would be developed with full consideration of endangered species. Appendix C is the District's biological assessment of the impacts on threatened and endangered species resulting from development or maintenance of the recreational beaches listed in Table 5-10. Development could affect threatened and endangered species at the following sites:

Pool 3 - 805.5-RM, 802.3-RM
Pool 4 - 762.4-RM, 756.2-RM
Pool 8 - 694.6-RM
Pool 9 - 678.2-RM, 677.8-LW, 676.7-LW, 676.0-RM and 665.3-RI
Pool 10 - 644.2-LW, 637.2-RI, 637.2-LW, 627.9-RI and 623.0-LW

Prior to construction activities at these sites, endangered species surveys and further assessment of potential impacts would be completed and coordinated with the USFWS.

5.4.4 Effects of Recreational Beach Development on the Upper Mississippi River National Wildlife and Fish Refuge (Refuge)

Development of beaches within the Upper Mississippi River National Wildlife and Fish Refuge would have the overall impact of increasing human usage of areas within the refuge.

5.4.5 Effects of Recreational Beach Development on Recreation Resources

The recreational beach sites, many of which are current or former dredged material placement sites, are very popular with boaters for camping, swimming, picnicking, and other beach-related activities. The users seek out sandy areas with suitable conditions to support their activities. Campers usually seek level areas back from the river that offer privacy. Day users want plenty of open sand areas for sunbathing, swimming and the like. Water that is deep enough to allow the boaters to beach their craft, yet shallow enough for swimming, is very important also. If left undisturbed, the placement sites would become overgrown, limiting their recreational use. Active placement sites and very popular recreation sites have enough activity to prevent excessive vegetative encroachment. However, on the lesser used/inactive sites, the vegetation would eventually displace recreational use. The overall impact would be that the growing number of recreational boaters seeking beaches would be crowded onto fewer beaches.

The primary purposes of the beach development program are to reshape existing placement sites to allow continued recreational use and, when practical, to nourish non-placement recreational beach sites. The purpose of the nourishment/reshaping is to enhance the utility of the site by eliminating vegetation and creating use nodes.

Table 5-10. Preliminary beach development sites under the CMMP.

Location	Site Priority	Estimated Capacity (cy)	Area of Fill (acres)	Placement Method	Endorsement
2-824.1-LM	N/A	Maintain, TBD by OSIT	TBD	H,M	GREAT
2-827.8-RM	N/A	Maintain, TBD by OSIT	TBD	H,M	GREAT
2-828.1-LM	N/A	Maintain, TBD by OSIT	TBD	H,M	GREAT
3-807.5-RM	N/A	Maintain, TBD by OSIT	TBD	H,M	GREAT
3-805.5-RM	N/A	Maintain, TBD by OSIT	TBD	H,M	GREAT
3-802.3-RM	N/A	Maintain, TBD by OSIT	TBD	H,M	GREAT
3-799.4-RM	N/A	Maintain, TBD by OSIT	TBD	H,M	GREAT
4-789.6-RM	N/A	Redevelop, TBD by OSIT	TBD	H,M	GREAT
4-784.7-RM	N/A	Redevelop, TBD by OSIT	TBD	H,M	GREAT
4-762.4-RM	N/A	Redevelop, TBD by OSIT	TBD	H,M	GREAT
4-759.5-LW	N/A	Maintain w/o fill	N/A	N/A	GREAT
4-756.2-RM	N/A	Redevelop, TBD by OSIT	TBD	H,M	GREAT
4-753.3-RM	N/A	Redevelop, TBD by OSIT	TBD	H,M	GREAT
5-749.7-LW	N/A	Maintain w/o fill	N/A	N/A	GREAT
5-743.6-RM	N/A	Maintain, TBD by OSIT	TBD	H,M	GREAT
5-741.6-RM	N/A	Maintain, TBD by OSIT	TBD	H,M	GREAT
7-712.8-LW	Low	5,000 or OSIT	0.9	M,Emerg. H	RRF - 8/88
7-712.1-LW	Medium	8,000	2.4	H,M	RRF - 8/88
7-711.7-RM	Medium	Reshape or OSIT	2.1	H,M	RRF - 8/88
7-709.0-LW	Medium	15,000	2.9	H,M	RRF - 8/88
7-706.5-LW	Medium	10,000	2	H	RRF - 8/88
7-706.5-RM	C	Maintain, TBD by OSIT	TBD	H	RRF - 8/88
7-705.0-LW	Medium	15,000	4.7	H,M	RRF - 8/88
8-694.6-RM	Medium	7,000-9,000	2.7	H,M	RRF - 8/88
8-692.5-LW	Medium	1,000-2,000	0.4	M	RRF - 8/88
8-691.6-LW	Medium	4,000-8,000	3.2	H,M	RRF - 8/88
8-690.8-RM	Low	3,000-5,000	1	Emerg. M	RRF - 8/88
8-690.5-RM	Medium	8,000-12,000	2.8	H,M	RRF - 8/88
8-690.2-LW	Low	N/A, reshape only	N/A	N/A	RRF - 8/88
8-689.2-LW	Medium	5,000-9,500	2	H,M	RRF - 8/88
8-688.5-RM	Medium	TBD	TBD	H,M	RRF - 8/88
8-688.2-LW	Low	N/A, reshape only	N/A	N/A	RRF - 8/88
9-678.2-RM	N/A	OSIT	TBD	H,M	RRF - 12/87
9-677.8-LW	N/A	OSIT	TBD	H,M	RRF - 12/87
9-676.7-LW	N/A	OSIT	TBD	H,M	RRF - 12/87
9-676.0-RM	N/A	OSIT	TBD	H,M	RRF - 12/87
9-671.4-RI	N/A	TBD by OSIT	TBD	H,M	RRF - 12/87
9-665.8-RI	N/A	TBD by OSIT	TBD	H,M	RRF - 12/87
9-665.3-RI	N/A	TBD by OSIT	TBD	H,M	RRF - 12/87
9-664.8-RI	N/A	TBD by OSIT	TBD	H,M	RRF - 12/87
9-664.3-RI	N/A	TBD by OSIT	TBD	H,M	RRF - 12/87
9-663.8-LW	N/A	TBD	TBD	H,M	RRF - 12/87
10-646.6-LW	High	20,000	4.3	H,M	RRF - 6/86
10-645.0-RI	Medium	8,000-12,000	2.1	H,M	RRF - 6/86
10-644.2-LW	High	14,000	2.1	H,M	RRF - 6/86
10-643.0-RI	Medium	10,000	1.5	H,M	RRF - 6/86
10-637.2-LW	Low	4,000	1.5	M	RRF - 6/86
10-637.2-RI	Medium	4,000	1	M	RRF - 6/86
10-627.9-RI	N/A	N/A - Maintain as is	N/A	N/A	RRF - 6/86
10-627.7-RI	High	7,000	1.1	H,M	RRF - 6/86
10-627.3-LW	Medium	6,000	0.9	H,M	RRF - 6/86
10-626.0-RI	High	4,000	0.6	M	RRF - 6/86
10-623.0-LW	High	20,000	4.2	M	RRF - 6/86
10-619.5-RI	Medium	5,000-9,000	1.7	H,M	RRF - 6/86
10-619.0-LW	Low	4,000	0.4	H,M	RRF - 6/86
10-618.6-LW	Medium	4,000-6,000	0.8	H,M	RRF - 6/86
10-618.6-RI	High	4,000	0.75	H,M	RRF - 6/86

Key To Abbreviations:
OSIT - On-Site Inspection Team
RRF - River Resources Forum
TBD - To Be Determined
H - Hydraulic
M - Mechanical
C - Completed

NOTES:

Sites endorsed by GREAT were not given priorities and specific areas were not identified. Action Item 19 in the GREAT I report identifies a list of recommended beach sites. GREAT I recommended sites are included in this table, but would be reviewed as part of the CMMP beach planning process and may be modified or eliminated.

Recreation Beach Maintenance Plans for Pools 7&8 were endorsed at RRF meeting #22 on 16-17 August 1988 with the condition "any references to minimum quantities on site plates be deleted and during implementation, OSIT notices should indicate a beach plan site is going to be used."

Recreation Beach Maintenance Plan for Pool 9 was endorsed at RRF meeting #19 on 2 December 1987 "with a change to the recommendation for site 9-663.8-LW, which leaves it open for further consideration."

Recreation Beach Maintenance Plan for Pool 10 was endorsed at RRF meeting #13 on 23 June 1986.

The recreational beach program can also be used to influence where recreation is occurring on the river. If only a few beaches were maintained, the adverse impacts associated with crowding and overuse could become significant. Sensitive areas can be avoided, and beaches can be developed in those areas that can support such uses with minimal degradation.

The overall impacts to recreation of the beach development program are beneficial to a substantial degree. The maintenance of expanses of sand may be an intrusion in the natural landscape. However, if the development plans include landscaping and reshaping, the intrusions can be reduced. The overall impact on the aesthetic environment would be minor but adverse.

5.4.6 Effects of Recreational Beach Development on Archaeological and Historic Resources

Beach nourishment and/or development involves either hydraulic or mechanical dredging, typically of medium to coarse sand. The effects on cultural resources from beach development would have to be determined as specific beach development plans are considered. Where the beaches are current or former dredged material placement sites, there may be no impacts or minimal impacts to cultural resources. Where the land on which the material is placed has been undisturbed, even if deposited upon in the past, a cultural resources review will be necessary.

The primary purposes of the beach development program are to reshape existing placement sites to allow continued recreational use and, when practical, to nourish non-placement recreational beach sites. Reshaping of existing dredged material placement sites for use as recreational beaches will not have an impact upon cultural resources as long as the extent of the placement site is not enlarged beyond the original boundaries. If enlargement of placement sites is considered, further cultural resources surveys may be warranted, depending upon the nature of the specific site.

As with other dredged material placement sites, beach nourishment at sites that have not been previously used may have a potential to adversely affect cultural resources. Use of specific areas for beach development may require cultural resources surveys be completed prior to site development.

Finally, the area around beaches should be evaluated to make sure that we do not encourage pedestrian access to or use of areas that have important archeological or historic sites.

5.4.7 Effects of Recreational Beach Development on Socioeconomic Resources

Recreational beach development would have no appreciable effects on socioeconomic resources, other than those discussed under "Recreational Resources" above.

5.5 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

This section discusses irrevocable uses of resources, changes in land use, destruction of archeological or historic sites, unalterable disruptions in the ecosystem, and other adverse environmental effects that could result from implementation of the CMMP. Resources committed for maintenance of the 9-foot channel are, for the most part, irreversible and irretrievable. Under the proposed CMMP, irreversible and irretrievable commitments of resources would continue into the future. The incremental difference in impacts on irreversible and irretrievable resources between the CMMP and GREAT I plans would be immeasurably small.

Raw materials used in structural modifications/maintenance or dredging/construction plant upgrades would be committed, but would not be wholly irreversible or irretrievable because it would be possible to retrieve and reuse components to an extent. Varying types and degrees of commitments of land use would result from conversions of land use necessary to develop the placement sites.

From a cultural resources perspective, the principal use of resources will be the time and funding needed to survey for archeological and historical sites, and the time and funding needed to mitigate for any damages to archeological and historical sites resulting from dredged material disposal or other channel maintenance activities. Any archeological or historic sites damaged or destroyed as a result of dredged material disposal or other channel maintenance activities would fall under irreversible and irretrievable losses of cultural resources.

Visual impacts resulting from the creation of placement sites are not considered irretrievable, as future abandonment of the 9-foot channel, however unlikely, would restore the viewshed. In addition, these visual impacts are being mitigated through landscape plantings.

Implementation of the CMMP would require a commitment of Federal economic resources by the Corps of Engineers to maintain the navigation channel through dredging, structural modifications/repair, and snagging. In addition, land acquisition costs and site development costs are associated with development of some of the CMMP placement sites. The assurance of the continued existence of a navigation channel would also result in the commitment of resources by the local, regional, and State governments as well as by the private sector to maintain and increase the shipping of commodities. Maintenance of the system, assuring low-cost waterway transportation, would also encourage commercial and industrial development along the UMR corridor. The amounts of these investments would depend on future supply and demands.

Recreational use would be encouraged by the presence and maintenance of recreational beaches. Development of recreational facilities, such as marinas and boat ramps, would be encouraged by maintenance of the system. This trend toward development can be considered irreversible, although under existing authorities, limitations on development could be imposed.

Dredging to maintain navigation and associated channel maintenance activities would also require an irretrievable commitment of fossil fuels. However, reductions in fossil fuel consumption for transportation of commodities would be realized because of the more energy efficient mode of transportation.

With the 4½-, 6-, and 9-foot channel projects, alteration of a "natural river" has occurred and can be considered a loss to future generations under present modes of operation and maintenance. The most significant effect on "natural" hydrologic rhythms, floodplain connectivity, hydrodynamics, and geomorphic processes is derived from the altered water levels from operating the river as a series of impoundments. The CMMP will contribute a small increment to the continued loss of "natural" river processes from the operation of the river as a 9-foot channel project. Recent efforts to revise water level management to simulate "natural" occurring hydrologic events and future planning efforts under the channel management plan can only be viewed as attempts to restore, to some degree, "natural" processes in a permanently altered hydrologic regime. They cannot be viewed as an attempt to restore a "natural" river. It is possible that some semblance of a "natural" river could be regained, if the locks and dams remain open year-round or all structures associated with the 4½-, 6-, and 9-foot channel were removed, effectively eliminating commercial navigation.

The loss of wetlands and aquatic areas as a result of dredged material placement is essentially irreversible. These areas because of placement of dredged material will generally be unable to support hydrophytic vegetation, characteristic of wetlands, because of changes in soils and hydrology. Under the CMMP, 213 acres of previously undisturbed wetlands and aquatic areas would be irrevocably lost. Wetland habitat loss above what is presently proposed within the CMMP would be mitigated, according to the mitigation policy contained in Appendix B of the CMMP and summarized in Section 5.6. The habitat quality of old dredged material and upland placement sites could be restored, at least partially, if a site or portions of a site were abandoned for placement of dredged material.

5.6 MITIGATION MEASURES

Mitigation measures include functional alternatives that have been incorporated into the preferred alternative that avoid, minimize, rectify or compensate potential adverse effects. Mitigation measures have been developed as part of the CMMP.

5.6.1 Measures to Reduce Dredging and Placement Requirements

Through a combination of the mitigative measures described below, projected 40-year dredged material volumes have been substantially reduced from both the with and without GREAT I projections. Many historical and GREAT I dredging areas have been deferred because of the mitigative measures described below (see Table A-1 of Appendix A).

5.6.1.1 Channel Dimensions

The GREAT I recommendation relative to dredging depths and channel widths is contained in recommended Action Item 4, which states:

"Average annual dredging quantities should be minimized through application of technically supported reduced-depth dredging and maintenance of minimum channel widths suitable for navigation consistent with the following guidelines:

a. Dredging depths in approaches to rigid structures should be determined by technically supported safety criteria.

b. Dredging depths at other locations should be determined based upon potential for increase in frequency of dredging, impacts on the transportation industry, and the demand for dredged material in the area.

A literature search and necessary supplemental research should be conducted to document the impact of channel depth on required channel width to maintain navigational safety."

Reduced depth dredging, without increased frequency of dredging, would reduce the long-term impacts of channel maintenance through reduced volumes of material placed at placement sites and thus smaller placement site dimensions. However if reduced depth dredging results in higher dredging frequency, then the long-term impacts would be similar to dredging deeper but less frequently. Frequent disturbance can result in a greater impact than less frequent, high volume dredging. Because of the highly variable nature of the dredge cuts in the District, it is impossible to clearly define the difference in impacts between shallow dredging (11 feet) and deep dredging (13 feet).

Maintaining a narrow channel would, in many instances, reduce impacts by reducing the amount of material being dredged. However, maintenance of a narrower channel could increase the frequency of dredging, negating the gains achieved by reducing channel width. Again, it is not

possible to clearly define the difference in impacts of maintaining various channel widths beyond the general overview given here.

Based on historic experience with and hydraulic characteristics of the particular dredge cut, and equipment operating parameters, alternative dredging depths on the UMR are generally 11, 12, or 13 feet below low control pool elevation. Factors favoring a decision to dredge shallower (less than 13 feet) are listed to the left, and those favoring a decision to dredge deeper (greater than 11 feet) are listed to the right.

<-----11 feet--------------------12 feet --------------------13 feet----->

1. Cut is not near a structure (i.e., dam, bridge) or not just downstream of a sediment laden tributary.	1. Cut is near a structure or just downstream of a sediment laden tributary.
2. Reach of river is an undivided bend.	2. Reach of river is straight and divided.
3. Cut is in a channel crossing or is in alignment with the thalweg.	3. Cut is on or near a point bar.
4. Cut does not fill under low flow conditions.	4. Cut fills under low flow conditions.
5. Dredging frequency is low and overall volumes have decreased from shallower dredging.	5. Dredging frequency is high and overall volumes have not decreased from shallower dredging.
6. Depths surrounding the cut are close to 11 feet.	6. Depths surrounding the cut are close to 13 feet.
7. Depths in cut are shallow (i.e., less than 9 feet) so that average face is efficient for equipment.	7. Depths in cut are close to dredging initiation depth (10.5 feet) so that average face is high for equipment efficiency.
8. Placement site can tolerate a high water slurry ratio for hydraulic dredging equipment.	8. Placement site requires a high sand slurry ratio for hydraulic dredging equipment.
9. Placement site has limited capacity or requires a long barge haul.	9. Placement site capacity or distance is not a factor.
10. Emergency channel conditions or heavy workload require timely completion.	10. Channel conditions do not require urgent completion.

Channel widths are relatively fixed on the UMR for straight channel sections.

Location	Width (feet)
Head of navigation (857.6) to LSAF (853.4)	150
LSAF (853.4) to L/D 2 (815.2)	200
L/D 2 (815.2) to L/D 10 (614.0)	300
Minnesota River (UMR 844.0)	100
St. Croix River (UMR 811.3)	200

The width in bends can extend up to 600 feet depending on the degree of curvature and hydraulic characteristics of the reach. During the GREAT I study, investigations were conducted by the Dredging Requirements and Commercial Transportation Work Groups to determine where bend widths could be modified to reduce dredging and improve navigation safety. A list of channel width guidelines was developed. Bend width increases of 50 feet were identified for nine locations as shown below.

Location	River Mile	Present Width (ft)	Identified Change
Grey Cloud Slough	827.3-828.0	400	+50
Boulanger Bend	820.3-821.5	450	+50
Truedale Slough	808.2-808.8	350	+50
Four Mile Island	807.2-807.8	450	+50
Head of Lake Pepin	785.2-785.6	450	+50
Reads Landing	762.4-763.3	450	+50
Below Reads Landing	761.5-762.5	450	+50
Mule Bend	747.8-748.8	450	+50
Betsy Slough Bend	731.0-731.7	450	+50

Bend width reductions of 50 to 150 feet were identified at 17 locations. At two sites, Lansing Upper Light (pool 9) and Winters Landing (pool 7), the District has already implemented wing dam modification projects to reduce dredging requirements and improve channel safety. The remaining 15 locations are:

Location	River Mile	Present Width (ft)	Identified Change
Boulanger Bend Lower Light	818.4-820.3	450	-50
Below Wind Creek	800.0-800.7	500	-50
Crats Island	758.0-759.5	500	-50
Below West Newton	746.6-746.9	500	-50
Broken Arrow	695.8-696.8	500	-50
Sand Slough	694.4-695.2	600	-100
Brownsville	689.7-690.2	500	-50
Island 126	677.2-678.2	500	-50
Bad Axe Bend	674.0-675.0	600	-150
Below Lansing	600.3-661.0	600	-100
Gordons Bay	645.5-643.5	600	-50
Mississippi Gardens	624.5-643.5	550	-50
Wyalusing Bend	628.6-629.3	600	-100
Wyalusing	627.2-628.0	600	-100
Ferry Slough	615.6-616.3	600	-150

Depending upon hydraulic analysis, past experience, environmental factors and other relative information dredging would be conducted to depths from 11 to 13 feet on a case-by-case basis. Table 5-11 lists the dredge cuts and recent dredging depths. The situation at the time of dredging would dictate dredging depths.

On straight channel sections the standard widths listed previously would be maintained. On bends, the width changes at the locations identified by the GREAT I study and shown previously would be used as guidelines for actual bend width changes. The CMMP describes the procedure used to determine the appropriate channel widths in the District (see Section 5.6.1.1). It is expected the actual changes would be similar to those suggested by the GREAT I study.

5.6.1.2 Channel Monitoring and Marking

Close monitoring of channel conditions helps assure dredging is performed when needed and unnecessary dredging is avoided. Because of the river's dynamic nature and propensity for relatively rapid shoaling and scouring, monitoring through the use of timely and accurate hydrographic surveys is a key element of the channel maintenance program. Substantial savings and reduced environmental impacts can be realized by having the technology and capability to conduct surveys at critical times during the hydrograph period. The District has observed significant improvements in shoaled areas as flows have decreased and the channel control structures have assisted the sediment transport process. Likewise, critical or restrictive conditions can be avoided or minimized by having timely channel condition information available, so that dredging can be programmed before water levels drop and an emergency results. Providing high quality channel information to the project user has also proven to be an effective method of avoiding groundings and potentially a more significant dredging event. Information sharing with the users will become a more valuable tool in the channel maintenance program as technological advances are made. The District supports improvements that will enhance the channel maintenance mission and will continue to pursue them.

The United States Coast Guard (USCG) is responsible for maintaining the aids to navigation (buoys, lights, daymarkers) that both commercial and recreational vessel operators rely upon. The District supports the USCG mission in any way appropriate. Hydrographic survey results are routinely furnished to the Coast Guard to provide their buoy tender current channel information. Off station buoys are reported or frequently corrected by Corps resources when Coast Guard resources are not readily available. The Corps or its dredging contractors will routinely reposition buoys after completing dredging to define the new channel alignment. In recent years, the District has dedicated equipment and personnel resources to early spring buoy setting. This is a critical time when buoys are severely off station, the Coast Guard cannot mobilize its resources because of ice conditions and commercial navigation is resuming for the season. The practice of supporting the USCG with spring buoy setting has been very effective in establishing a well-marked channel early in the season and potentially avoiding economically and environmentally damaging vessel groundings. The District intends to continue this practice and also that of providing general support because of the potential benefits it provides to the channel maintenance program through grounding and dredging avoidance. The

Table 5-11. Typical dredging depths at UMR dredge cuts.

Pool/Cut	Depth (ft)	Pool/Cut	Depth (ft)	Pool/Cut	Depth (ft)
USAF*		***Pool 3***		***Pool 6***	
Above Plymouth Ave. Bridge	12	Diamond Bluff	11-12	Homer	11-12
Broadway Ave. Bridge	12	Coulter's Island	11-12	Gravel Point	11-12
Above Lowry Ave. Bridge	12	Morgan's Coulee	11-12	Below Winona Railroad Bridge	11-12
Minneapolis Turning Basin	12	Big River	11-12	***Pool 7***	
Pool 1		4-Mile Island	11-12	Upper Approach to L/D 7	12
Upper Approach to L/D 1	12	Truedale Slough	11-12	Lower Dresbach Island	12
St. Paul Daymark	12	Prescott	11-12	Head of Dresbach	12
Below Lake Street Bridge	12	Lower Approach to L/D 2	11-12	Dakota	12
Above Lake Street Bridge	12	***Pool 4***		Winter's Landing	12
Below Franklin Ave. Bridge	12	Beef Slough	12	Richmond Island	12
Above Franklin Ave. Bridge	12	Grand Encampment	12	Lower Approach to L/D 6	12
Washington Ave. Bridge	12	Above Teepeota Point	12-13	***Pool 8***	
Lower Approach to LSAF*	12	Above Crat's Island	12-13	Deadman's Slough	12-13
Minnesota River		Read's Landing	13	Head of Raft Channel	12-13
Mouth of the Minnesota River	11-12	Chippewa Delta	13	Brownsville	12-13
4-Mile Cutoff	11-12	Head of Lake Pepin	11	Above Brownsville	12-13
Above 35W Bridge	11-12	Below Red Wing Hwy. Bridge	11	Picayune Island	11-12
Below Peterson's Bar	11-12	Above Red Wing Hwy. Bridge	11	Sand Slough	11-12
Peterson's Bar	11-12	Cannon River	11	LaCrosse Railroad Bridge	13
Cargill Slip	11-12	Trenton	11	***Pool 9***	
Above Savage Railroad Bridge	11-12	***Pool 5***		Lansing Upper Light	12
Pool 2		Sommerfield Island	11-12	Indian Camp Light	12
Boulanger Bend Lower Light	12	Lower Zumbro	11-12	Battle Island	12
Boulanger Bend	12	Fisher Island	11-12	Twin Island	12
Pine Bend	12	Below West Newton	11-12	Island 126	12
Robinson Rocks	12	West Newton	11-12	Lower Approach to L/D 8	12
Grey Cloud Slough	12	Mule Bend	11-12	***Pool 10***	
St. Paul Barge Terminal	13	Lower Approach to L/D 4	11-12	McMillan Island	11-12
Above and Below Smith Ave.	12	***Pool 5A***		Mississippi Gardens	11-12
St. Croix River		Wild's Bend	12	Jackson Island	11-12
Kinnickinnic Bar	13	Betsy Slough	12	Hay Point	11-12
		Fountain City	11-12		
		Island 58	11-12		

* Upper St. Anthony Falls

District also supports the Coast Guard in relocating permanent aids to navigation as the natural channel shifts course and these markers no longer adequately identify the navigation channel. It is not cost effective to dredge the channel to align with "obsolete" markers.

5.6.1.3 Dredging Equipment

Two basic types of dredging equipment are available--mechanical and hydraulic--both Government and privately owned. Government owned equipment available includes a 20-inch hydraulic dredge (WILLIAM A. THOMPSON) and a 12-inch hydraulic dredge (DUBUQUE). Private contractor equipment includes a variety of mechanical and hydraulic dredges up to 24 inches in size. A more detailed description of equipment availability and capability is contained in the CMMP on pages 20-22. Current policy allows the limited use of Government owned mechanical equipment for channel maintenance dredging. Most of the mechanical dredging is contracted with the private sector.

The impacts of different dredge equipment can only be discussed generically because the actual impacts of a particular dredging job are highly variable depending upon location, type of material, volume, time of year, and placement site location. Generally, hydraulic dredging equipment has less impact on water quality at the dredge cut site, but more impact at the placement site because of the effluent discharged.

At the dredge cut site, impacts to fish and other aquatic resources are similar between equipment types. Both extensively disturb bottom substrate within the immediate dredge cut and also outside the cut through increased turbidity and suspended solids concentrations. Mechanical dredging has a greater potential for adversely affecting water quality at the dredging location because of the increased turbidity and suspended solids generated by this method. Hydraulic dredging tends to have greater impacts on terrestrial habitats and species at the placement site because a larger area is required for placement. Additionally, the effluent generated by hydraulic dredging can affect water quality.

Impacts on recreation and socioeconomic resources between equipment types are similar. However, hydraulic methods generally tend to be more economical because of the greater productivity, in terms of material removed per unit effort, than mechanical dredging. Impacts on cultural resources have the potential for being greater with hydraulic dredging, again because of the larger placement sites generally required.

The decision on which type of equipment to employ for a particular dredging job is based primarily on the availability of equipment, size of the job, location and type of placement sites, and other dredging requirements at other locations. From an alternatives perspective, there are basically four equipment alternatives for every dredging job:

1 - Government hydraulic	2 - Government mechanical
3 - private hydraulic	4 - private mechanical

Depending upon many factors, one or more of the above alternatives may not be available at the time a particular dredging action is required. However, Government hydraulic and contractor mechanical equipment would be the primary methods of dredging employed under the CMMP. Selection of equipment would be determined by examining dredge cut characteristics. This maximizes the District's options in insuring a safe and reliable navigation channel in a cost effective, environmentally sound manner. Current policy is to use Government mechanical equipment only in limited situations (i.e., emergencies) or when other equipment options are not available.

The volume of material to be dredged and the distance between the dredge cut and placement site usually dictate the type of dredging equipment employed. The type of equipment expected to be employed at the various dredge cuts is identified in the CMMP.

5.6.2 Program Coordination

Discussed below are a number of methods the District uses to facilitate the coordination process to provide the best overall placement site planning and to mitigate potential impacts.

The On-Site Inspection Team (OSIT) was organized during the GREAT study to provide a mechanism for timely coordination of dredging events and channel maintenance activities with field level State and Federal resource managers. It also allows local communities and other organizations involvement in the program. It is valuable for providing information on proposed actions to agencies at a review level where it can be evaluated immediately for potential impacts. It allows the District the opportunity to obtain advice and recommendations from "local technical experts" as the activity is being planned. The District uses this input in formulating a final decision on a proposed action. The OSIT also facilitates the regulatory process by providing regulating agencies an early review of the action and allows the District an opportunity to obtain information related to regulatory procedures. The OSIT is used for a variety of purposes: notification for routine dredging events with designated placement sites; operational planning for placement site implementation; alternative site identification for long-range dredged material placement planning; coordination and site selection for emergency and imminent closure dredging; and planning and design of channel modification work. OSIT procedures are described in the CMMP.

The River Resources Forum (RRF) is an outgrowth of the GREAT study for continuing interagency cooperation. When that study was completed in 1980, participating agencies realized the cooperation and coordination process that was established during the GREAT study should continue. Agencies with river resource management responsibilities needed a mechanism for ongoing coordination of channel maintenance and related activities. Therefore, they joined together to form a partnership which started as the Channel Maintenance Forum and later became the River Resources Forum in recognition of an increased emphasis on coordination of environmental and recreational resources. Participating Federal agencies are: Corps of Engineers, Fish and Wildlife Service, Coast Guard, Environmental Protection Agency, Natural Resources Conservation Service and National Park Service. State agencies include the

Departments of Natural Resources and Departments of Transportation from Minnesota, Wisconsin and Iowa and the Minnesota Pollution Control Agency. Representation is at the middle manager/policy-maker level, which has been successful in achieving results, because participants can effectively represent the interests and positions of their respective agencies.

In 1991, participating agencies entered into a formal partnership agreement that states "We, the partners involved in management of the Mississippi River, recognize the multiple uses and benefits provided by this diverse ecosystem and are committed to work together as a trusting, cooperative team to manage the River from a resource-balanced approach in the best interest of the public." The group has established goals and procedures for working together cooperatively that are described in the partnership agreement and accompanying operating procedures. The RRF is used to build consensuses for proposed actions and to streamline administrative procedures. For the channel maintenance program, it provides a mechanism by which the District can obtain the collective endorsement and support of other agencies when selecting new placement sites or implementing channel modification activities. The RRF is an advisory group that has no statutory or regulatory authority. Recommendations of the RRF are not binding upon any of the participating agencies, nor does coordination of activities through the RRF eliminate the need for formal coordination and approval with the appropriate regulatory agencies. However, through effective communication and compromise, the District has been successful in obtaining RRF consensus on channel maintenance related proposals and will continue to pursue RRF support in the future.

The RRF meets three times per year, normally in April, August and December. Field trips are sometimes arranged in conjunction with the meetings so that managers have an opportunity to observe activities firsthand. The RRF also has sub-groups for providing technical advice on matters related to fish and wildlife resources, navigation, recreation and public information and education. These groups are used when issues are technically complex or more involved and the RRF cannot take the time necessary to fully investigate details.

5.6.3 Placement Site Mitigation

5.6.3.1 Water Quality Mitigation Measures

Routine sediment quality monitoring is conducted to define the mitigative measures necessary for a given placement site to ensure that placement of dredged material does not result in unacceptable water quality impacts. In areas of contaminant concerns, dredging either is done mechanically or hydraulically and placed in confined placement sites, equipped with drop structures, to maximize effluent quality and minimize water quality impacts. A standard operating procedure outlining the tests methods and monitoring protocol is contained in Appendix C of the CMMP.

5.6.3.2 Archeological and Historic Resources Mitigation Measures

Where it is necessary to place dredged material on a National Register of Historic Places archeological site, and no human burials are involved, the Corps would undertake coordination with the appropriate Native American tribes, the State Historic Preservation Office (SHPO), the Advisory Council on Historic Preservation (Council), and other interested parties to develop a Memorandum of Agreement (MOA) detailing the appropriate mitigation. Mitigation generally includes excavations to determine the extent and nature of an archeological site so it can be recorded and studied later. Mitigation can include the publication of a report and/or a scholarly article or brochure describing the site. The level of mitigation depends upon the significance of the site, however.

Where it is necessary to place dredged material on a National Register of Historic Places archeological site, and Native American burials are involved, the Corps would have to undertake extensive and close coordination with the appropriate Native American tribes, the SHPO, the Council, and other interested parties to determine the appropriate mitigation. Through consultation, all the above parties would develop a MOA to detail the needed mitigation. Mitigation could range from taking steps respectful of the burials while placing the dredged material to excavating the burials and reburying them at another location. The District would have to comply with all the relevant portions of the Native American Graves Protection and Repatriation Act (NAGPRA).

Where a placement site has Native American burials on it but the associated archeological sites do not merit inclusion on the National Register, the District would still have to carry out extensive and close coordination with the appropriate Native American tribe or tribes and comply with the relevant portions of NAGPRA.

5.6.3.3 Economic and Social Resources Mitigation Measures

Operation of a dredged material placement or stockpile site in or near a residential area creates a number of social concerns. There is noise associated with the placement of material at the site and also with the beneficial use removal operation. At some locations, local zoning ordinances may affect scheduling of the operations. Trucking operations to and from the site can have an impact on local road maintenance and at some locations is controlled by the local municipality. Visual impacts are also a major concern for any site whether it is near a community or exposed to boaters on the river. In general, dredged material placement operations and beneficial use removal often are not compatible with surrounding land use. Measures will be taken where appropriate to ameliorate these concerns. These efforts may include fencing, plantings, and limiting hours of operation. Sites or portions of sites that are no longer used would be considered for shaping and planting to improve aesthetics. Vegetative screening of permanent placement sites would be conducted, when determined to be appropriate. In residential areas there is a concern by the residents with the potential to contaminate groundwater and private and municipal wells with large hydraulic transfers of dredge material. Monitoring of groundwater

and development of contingency plans would be completed in coordination with the concerns of residents to ensure that real or percieved problems are remedied.

A major objective of the District is to place material at locations where it can be used productively, either directly at the location where it is placed or for removal and beneficial use elsewhere. The District has provided dredged material for a variety of uses to other Federal agencies, State agencies, counties, municipalities, contractors, private organizations and private landowners. Material placed at federally owned stockpile sites is made available, at no cost, to anyone interested in removal of it on a first-come basis. However, if there are competing demands for the material and cost considerations are comparable, the District's policy is to provide the material to the governmental entity that represents the largest public constituency. Maximizing beneficial use, besides providing economic benefits to the user, reduces the environmental consequences of future placement.

5.6.3.4 Fish and Wildlife Resources Mitigation

In plan development for placement sites, the required size for placement was minimized to the extent practicable by stacking the material higher and other measures, while balancing operation, water quality, social, and other concerns. At certain placement sites, restrictions on timing have been incorporated into the plan to minimize environmental effects, including the potential to disturb bald eagle nesting and winter roosting activities.

Protection measures are needed at many locations to minimize erosion from wind, waves and water flow. Measures include vegetative plantings, fencing, walls and rock protection as determined by individual site requirements. Measures vary by the stage of filling at the site and the anticipated future use of the area. The District's objective is to assure that material does not erode from federally owned sites. On non-federally owned sites, the landowners are responsible for protection of material placed on their property. Permanent sites that are filled to capacity will be considered for final shaping, placement of topsoil, and planting to protect the site and improve the aesthetics. Filling of a site will progress in a logical manner as influenced by the location of the dredge cut and site characteristics such as topography and configuration. When possible, only that portion of larger sites needed for conducting an efficient placement operation will be prepared (i.e., diked, cleared) and used at a given time. The remaining area will be left undisturbed until use of it becomes necessary. Site capacity will be monitored to determine when additional planning is necessary for selecting a future replacement site.

Environmental damages resulting from emergency dredging and placement would be rectified as soon as practicable and to the extent practicable.

5.6.4 Wetland Mitigation

The District understands the site planning process may result in the selection of an alternative that includes an unavoidable impact on wetland habitat. At a national level, the Corps of Engineers does not have an established policy for mitigation of unavoidable wetland impacts

resulting from operation and maintenance of existing projects. It is the District's position that authority for mitigation exists and therefore a District-wide policy has been developed and is incorporated into the CMMP as Appendix B - District Mitigation Policy. The District's position is that the CMMP represents a baseline condition that has evolved from previously approved plans prepared prior to mitigation requirements or authority. The CMMP was developed without the benefit of considering mitigation requirements in the evaluation process and therefore those requirements should not be applied at this time. Implementation was agreed to and has been initiated at nearly all the sites in the plan. Avoid and minimize measures applied in the planning process have successfully reduced the projected wetland impacts of the CMMP to 45 percent (approximately 213 acres) of the approved dredged material placement plan contained in the GREAT I study. The total projected placement site needs of the CMMP are approximately 865 acres or 77 percent of the 1,118 acres projected in the GREAT study. It is anticipated that even further reductions in projected wetland impacts will result through good management efforts during implementation. The District's policy is that compensatory mitigation is not required for impacts associated with implementation of the 1996 version of the CMMP. Proposed wetland impacts that exceed the 1996 CMMP projections will be compensated for in accordance with the established policy.

5.7 CUMULATIVE IMPACTS

The Upper Mississippi River System (UMRS) is a highly modified large river ecosystem. Human-accelerated change is evident throughout the UMRS river basin, river channels and floodplains. Hundreds of generations of native Americans modified the landscape along the rivers with fire and clearing for agriculture. European settlement of the basin began in earnest in the 1840's, and led to the present-day landscape within the UMRS basin that is nearly entirely modified by human use and supports a human population of more than 10 million people. The aquatic and floodplain habitats of the UMRS mainstem rivers are among the most physically altered areas in the basin. The remaining wild habitats in the UMRS river corridors have become increasingly important for fish, wildlife, recreation, and beauty as development and other human uses have expanded in the river basin.

The cumulative impact of the continued operation and maintenance of the 9-foot navigation project is one of the major unresolved issues identified by resource management agencies, the public, and private groups concerning the ecological sustainability of the UMR. A multitude of factors will affect the future environment of the UMR: continued operation and maintenance of the navigation system; hydrologic and hydraulic processes in an altered environment; commercial traffic; public use; point and non-point pollution; commercial and residential development; agricultural practices and watershed management; exotic species; and a host of other factors. Compounding these factors are the diversity of uses of the river. People and the resultant public agencies that have developed to serve their respective constituency, have different visions of the river. No common goals and objectives for river management have been established. Many people feel that unless environmental conditions change, the river's plants, fish, and wildlife may cross a threshold where catastrophic declines become inevitable (UMRCC 1993); others view it as a continued progressive change/decline in fish and wildlife values. Because of these concerns, numerous efforts have been undertaken recently to try to provide direction on how to balance differing visions of the river while securing its economic benefits and protecting its ecological integrity (UMRCC 1993; Izaak Walton League of America and Natural Resources Defense Council 1994; SAST 1994; Hesse et al. 1993; Freshwater Foundation and McKnight Foundation 1995; Mississippi River Corridor Commission 1995; U.S. Army Corps of Engineers 1995b). At the February 1996 "Upper Mississippi River Summit" meeting, representatives from the various Federal and State agencies and river user groups agreed to the following vision statement: "to seek long term compatibility of the economic use and ecological integrity of the Upper Mississippi River."

It is the intent of this document to provide at least a qualitative cumulative impact assessment of all factors, including continued operation of the 9-foot navigation channel, that will ultimately dictate the future of the economic, cultural and environmental quality of the UMR. In addition, it is the intent of this document to provide a quantitative assessment of the cumulative impacts over the next 40 years of the dredged material placement, including recreational beach maintenance, and snagging portions of the CMMP and outline concerns and procedural steps that will be followed to evaluate the cumulative impacts of maintenance and modification of channel control structures.

5.7.1 Past Cumulative Impact Assessments

The cumulative impacts of the continued operation and maintenance of the 9-foot navigation channel were discussed in the 1974 EIS (USACE 1974) and are incorporated by reference and summarized below. The 1974 EIS documented that continued operation and maintenance would result in significant damage to wetland and aquatic resources of the UMR. In addition, the EIS documented that the continued operation and maintenance of the 9-foot navigation channel contributes significantly to the long-term productivity of the region and nation by permitting the economic advantages of low cost waterborne transportation. The changes in the cumulative impacts with the GREAT I channel maintenance plan were discussed in the 1980 GREAT I EIS (GREAT I 1980) and are incorporated by reference and summarized below. The GREAT I channel maintenance action recommendations, if implemented, would have reduced the adverse impacts associated with channel maintenance activities while providing for safe navigation. This reduction would have been accomplished through the implementation of the GREAT I Dredged Material Placement Plan (DMPP) as well as other recommendations such as reducing dredging volumes, using more efficient equipment, following guidelines designed to protect environmental quality, and planning disposal sites to minimize impacts and to enhance site recovery and resource values. The cumulative impacts of the GREAT I DMMP over time are summarized in the GREAT I EIS and sections 3 and 5 of this EIS. In addition, the following planning documents and associated NEPA documents have been prepared by Federal agencies, which have also treated cumulative impacts and are incorporated by reference: the 1987 UMR Refuge Master Plan and EIS prepared by the U.S. Fish and Wildlife Service; the 1987 Environmental Assessment for the Major Rehabilitation of Locks and Dams 2-10; the 1983 Master Plan for Public Use Development and Resource Management, including Land Use Allocation Plan and Environmental Assessment; and the 1993 Operational Management Plan and Environmental Assessment.

5.7.2 Proposed Action

The cumulative impacts of the proposed St. Paul District CMMP should be a further reduction, above and beyond the GREAT I DMMP, in adverse natural and social resources impacts associated with channel maintenance activities. This reduction would be accomplished through the implementation of the proposed placement site plans, with reduced impacts (both acres and habitat quality), as well as through the mitigative measures identified in this EIS in sections 3 and 5. The CMMP would have similar impacts to the GREAT I DMMP on cultural resources. The cumulative impacts of the Channel Maintenance Management Plan over time (40 years) are summarized in sections 3 and 5 of this EIS and are discussed below.

5.7.2.1 General

The UMR and tributaries are ancient rivers, with many endemic species evolved over millennia to be exquisitely adapted to river floodplain and aquatic habitats. The UMRS was once one of the most productive river systems in the world, with an astonishing abundance of fish and waterfowl.

Human intervention with the natural riverine environment began in earnest in the late 1800's with construction of the system of channel training structures. Further modification of aquatic and floodplain habitats of the UMRS has resulted from: 1) conversion of woodlands and prairies to intensive agricultural land use in the late 1800's and early 1900's resulting in accelerated delivery of sediment to the river, 2) impoundment and river regulation since construction of the navigation dams in the 1930's, and 3) levee construction and conversion of natural floodplain to agricultural and urban development.

The present human world population is close to 6 billion and is projected to grow to more than 10 billion in the next 30 to 40 years. However, population in the UMR region has grown slowly over the past decade, at rates less than a fifth of the national average. This slow continuous growth has not been consistent throughout the region, with the Twin Cities and cities and counties bordering the river north of the Twin Cities showing very rapid growth and the areas downstream of the Twin Cities showing much slower growth. As the population in the area continues its slow growth, the multiple use demands placed on the UMR and tributaries will increase. The UMR with its scenic beauty, sports fisheries, abundant wildlife, and attractive river towns, sustains growing recreation and tourism industries. More than half the people using the river's recreation areas say aesthetic appeal and quality of fishing and hunting are the primary reasons they use the area. These visitors say threats to the river's environmental quality are their greatest concerns about the UMR's future (USACE 1993b).

One step in completing a cumulative impact assessment is to identify the reasonably foreseeable actions of people, including other actions of the Corps of Engineers outside of the proposed CMMP. The projections for future management actions discussed below were done only for the purposes of this cumulative impact assessment. It is recognized through some of the ongoing efforts like the Upper Mississippi River Summit (formerly Big River Partnership) significant changes in river management, which might greatly affect the future conditions of the river, could occur within the 40-year planning horizon for this project.

A discussion of the significant resources of the UMR basin and the cumulative impacts of the reasonably foreseeable actions discussed below is presented in the following sections.

5.7.2.1.1 Operation of the 9-Foot Channel Project

Because of the economic significance of the 9-foot channel project, de-authorization and abandonment of the 9-foot channel project within the 40-year planning horizon used for the CMMP is an unlikely event. In fact, in April 1993 the Corps of Engineers initiated a multi-year feasibility study to look at system-wide navigation improvements (USACE 1994). However, for the purposes of this assessment, it is projected that over the 40-year planning horizon, operation of the 9-Foot Navigation Channel project would continue in a manner very similar to the last 60+ years. Dredging and disposal; construction, maintenance, and modification of channel control structures; and maintenance of authorized water surfaces, in combination with other man-induced alterations and natural processes, has and will continue to have significant impacts on river geomorphology and hydrodynamic conditions. This has and will result in changes in habitat

conditions, i.e., backwater lakes and ponds will experience gradual filling, land areas in the lower portion of the pools will continue to be eroded and the system will continue to experience the impacts of channelization. The modified system will continue to evolve through successional processes as the system adjusts to the changes from the 9-foot navigation channel project. Additionally, continued operation and maintenance ensures and encourages use of the river by both commercial and recreational craft.

In 1996, the St. Paul District under the auspices of the Water Level Management Task Force initiated a reconnaissance level study of water level management (Water Level Management Task Force, 1996). This study examined a variety of water level management alternatives, including drawdown alternatives. Modification of the current method of navigation pool regulation has the potential to provide significant environmental benefits. However, there are significant environmental, economic, social, and recreational concerns associated with some of the alternatives evaluated. The study identified that at least some limited level of drawdown in pool 8 (and possibly in other pools) would be feasible without interruption of the authorized purpose of commercial navigation. More significant modifications such as large scale drawdowns greater than 1 foot may require separate congressional authorization. It is possible that some changes in navigation pool regulation will occur in the future. However, the extent of these potential changes is unknown. Taking a conservative approach for the purposes of this evaluation, significant changes in navigation pool regulation are not projected for the 40-year planning window.

5.7.2.1.2 Watershed Management Initiatives

Responsibility for watershed management lies with the general public and a variety of federal, state, and local agencies. Watershed management has the potential to cause significant improvements in the environmental characteristics of the UMR, through reduced sediment, nutrient and contaminant loading. Programs like the Conservation Reserve Program (CRP) and best management practices espoused by the Natural Resources Conservation Service (formerly Soil Conservation Service) have set the stage for watershed management. In addition, the three States also have active programs, like the Reinvest in Minnesota and Minnesota River Assessment Plan, to treat watershed management. However, watershed management must be viewed in the long-term, with the major benefits to be realized after an extensive period of time. It will take many years of effort to appreciably change sediment loadings, because of the extensive alterations of land use that has occurred in many of the tributary basins. For instance, in the 44,300 km^2 Minnesota River basin, 75 percent of the land use is agricultural (row crops) (Hesse et al. 1993). Open ditch and tile drainage systems are found on more than a third of the cultivated land and most of the wetlands have either been filled or drained. With these kinds of significant alteration of the basin's landscapes, improvements in land management would occur only slowly over time. In addition, sediments have been trapped in the tributary floodplains because of the accelerated sediment loading that resulted from man's alterations of the watersheds over the last 150 years. Excess tributary floodplain sediments will continue to be a major source of sediments to the UMR for many years to come. For the purposes of this

assessment, sediment loading to the UMR from tributaries is projected to continue at high, similar rates during the project planning horizon.

5.7.2.1.3 National Pollutant Discharge Elimination

Point sources of pollution are controlled under the National Pollutant Discharge Elimination System (NPDES). The amount of toxic substances discharged from point sources into the UMR and its tributaries has declined over the last 20 years, due to industries and metropolitan areas investments in pollution prevention and waste treatment facilities to meet NPDES effluent standards. For the purposes of this assessment, point source pollution is projected to continue to decline.

5.7.2.1.4 Environmental Management Program and Other State and Federal Programs

The Environmental Management Program (EMP) was authorized in 1986. One of the major components of the EMP was to design and construct habitat rehabilitation and enhancement projects. EMP is scheduled to end in 2002. Within the St. Paul District, about 24 projects, affecting nearly 18,000 acres, at a cost of $41 million will be constructed by the time the program ends. EMP has generally been geared to addressing localized resource problems and will have directly affected only about 7 percent of the 245,000 acres of wetland/aquatic resources present within the St. Paul District portion of the UMR 9-foot navigation channel project limits. Even though the EMP will only directly affect a small percentage of the wetland/aquatic resources present, the EMP, in combination with other projects like the Weaver Bottoms Rehabilitation project, will have a substantial effect on river hydrology and sediment transport. Many of these projects are geared to affecting the distribution of river flows and sediment transport. In addition, many of the EMP projects focus on areas identified by resource managers as important habitat with resource problems. Therefore, the environmental benefits associated with the EMP may be substantially greater than the simple comparison of the directly affected acres. Continuation of this program or creation of an alternate program would require congressional action. Therefore, this or a similar program is not projected for the future as part of this EIS.

Generally, management of floodplain habitat by other Federal and State resource agencies have been limited to (1) management of public use (i.e., harvest regulations; public access and use; regulation on private and public development; etc.) and (2) small scale fixes to local problems, similar to the EMP. The present economic outlook, both at the State and National level, would seem to indicate that future management is likely to continue in this fashion. Efforts like the Upper Mississippi River Summit (formerly Big River Partnership, formerly Upper Mississippi River Summit) are attempting to create a more cooperative management strategy amongst the agencies and public. An interagency partnership of this nature could significantly change future management. Large scale ecological floodplain restoration may be possible under these kinds of efforts. However, to be conservative and only for the purposes of the EIS, significant changes in management strategies are not projected for the future.

5.7.2.2 Cumulative Impacts on Water Resources

5.7.2.2.1 Effects of Watershed Use - Past, Present and Future

Recent geomorphological investigations of the UMR and its tributaries have provided good insight into the geological history of the UMR valley (Church 1985, Dobbs and Mooers 1991, and GLARC 1996). The position of the UMR valley below the Twin Cities has been governed by events during glaciation (Pleistocene) and generally fixed in location since the early Pleistocene. The present UMR valley in southeastern Minnesota and southwestern Wisconsin represents the approximate limit of Pleistocene glaciation and is part of the Driftless Area. The UMR above the Twin Cities has changed position many times during this same time period. The UMR valley and surrounding valleys were downcut into the limestone, dolomite, siltstone, and sandstone bedrock by successive episodes of glacial meltwater. Since the final episode of downcutting some 9,500 years ago during the early Holocene period (10,000 years before present (B.P.)), the river valley has been partially refilled with sediments alluvial in nature (Dobbs and Mooers 1991). Three major landforms types occur in the UMR valley: (1) the dissected uplands; (2) the Pleistocene and Early Holocene terraces; and (3) the floodplain. The floodplain landform has been much more influenced by the Holocene aggradation and degradation process. The Chippewa River had and has a tremendous influence on the character of the river, with its delta acting as a large dam, forming Lake Pepin, which at one time extended all the way to St. Paul, Minnesota. This stretch of the River floodplain has undergone extensive changes during the Holocene period (Dobbs and Mooers 1991). Although many of these changes occurred during the early Holocene, the floodplain has been reworked many times by periodic floods. However, the main channel has been in the same location for at least the last 200 years (Simon et al. 1976). In contrast to this reach of the river, the main channel in pools 7 through 10 has been much more consistent, being fixed in place throughout much of the Holocene period (GLARC 1996). Beginning in 1878 with the 4½-foot navigation channel, the construction of channel training structures has further fixed the location of the main channel ensuring the channel did not migrate across the floodplain.

Present flow mechanics in the basin are controlled by multiple forces. Precipitation, evaporation, surficial aquifers, and deep aquifers play a part in the natural hydrology of the watershed. Settlement and subsequent development of the watershed have altered the hydrology of the basin. Draining of wetlands for agricultural and residential development purposes and channelization of tributaries have reduced the upland storage and retention, hastening runoff and generally increasing erosion. Recharge of surficial and deep aquifers has been reduced because of the reduced upland storage and retention. In addition, water supply demands on the aquifers from irrigation and public consumption, especially in the more urban areas, has increased. These alterations have changed the water and sediment discharges of the tributaries, with subsequent impacts on the UMR such as increased sedimentation.

5.7.2.2.2 Effects of Operation of the 9-Foot Channel Project - Past, Present and Future

The navigation dams, levees, and channel training structures have stabilized water levels and the form of the channels and floodplain of the UMRS, greatly reducing the dynamic character of the remaining floodplain and aquatic habitats. The non-main channel water areas in the middle to lower subreaches of each pool increased substantially due to flooding of marshes, bottomland forest, and meadows.

In each newly created pool, the riverbed elevation aggraded above and near the primary control points because the creation of pools above each lock and dam slowed the velocity of the river, thus, reducing the sediment transport capability of the system. Degradation of the river bed occurred immediately downstream of the lock and dam due to dredging and the trapping of sediments in the upstream pool and the resulting discharge of sediment starved water from the locks and dams.

Creation of the navigation pools raised the base elevation of some UMRS tributaries. In the last six decades since construction of the navigation system, increased amounts of sediment transported from the tributary watersheds, has formed deltas in the lower reaches of these tributary rivers. These deltas have formed floodplain areas that have become increasingly difficult to farm, and are reverting to wild floodplain habitat in a number of areas.

Sediment deposition rates found in early sediment investigation varied between 1 and 2 cm/yr (McHenry and Ritchie 1975, Eckblad et al. 1977, Fremling et al. 1976). These early investigators concluded that many backwaters on the Mississippi River would be filled with sediment in 50 to 200 years. In pool 19, Bhowmik et al. (1986), concluded that, by the year 2050, the river would change from a lake-like appearance to a river- and floodplain-like environment with an incised channel. However, Chen and Simons (1979), based on a one-dimensional water and sediment routing model, predicted a river scene in the UMR 50 years into the future that would be essentially as it is today if no major man-made changes or natural events occur. Stage and discharge relations in the next 50 years would remain essentially as they are today. Geomorphic changes would continue following historical trends, but at a slower rate.

Recent investigations appear to support a slow change hypothesis. Korschgen (1987) found an annual deposition rate of 0.2 cm/yr in Lake Onalaska for the years 1937 to 1983. Rogalla and Boma (1996) found deposition rates (in centimeters per year) of 0.29, 0.12, and 0.80 in pools 4, 8, and 13 respectively. In Weaver Bottoms, historic deposition rates (1932-1986) are 0.18 to 0.22 cm/yr ; while more recent deposition rates (1986-1991) have increased to 0.37 cm/yr (Anderson et al. 1993). Reasons for the lower deposition rates found in recent studies are related to both study protocol and physical changes in the river. Early investigations may have focused on deposition areas, while more recent investigations didn't have this bias. Physical and biological changes in the river system have also occurred. As backwater areas accrete sediment, their bed approaches dynamic equilibrium with the hydrodynamic forces affecting sediment movement, such as current velocity and wave action. Daily and seasonal differences in sediment transport affect bed elevations, but accretion rates will have been reduced to pre-colonization

levels. Bhowmik et al. (1986) studied pool volume changes in Pool 19 and found that trap efficiency had decreased from 50-percent in the 1920's to 23-percent in the 1970's. In addition, reductions in plant communities may decrease sediment stability and increase hydrodynamic forces at the sediment-water interface, increasing sediment outflows. James and Barko (1990) found high levels of sediment accretion in vegetated littoral zones of Eau Galle Reservoir, Wisconsin and hypothesized submersed aquatic plants promote sediment accumulation.

Based on the above discussion, fine sediment will continue to accumulate in backwater areas, though at reduced rates. Bathymetric diversity will decrease and fine sediment movement in backwaters will be dominated by daily variations in wind-driven wave action. Some backwaters may eventually reach a point of dynamic equilibrium between fine sediment transport and hydrodynamic forces, though the physical conditions (shallow depth, unconsolidated bottom sediments, etc.) may not be desirable. Reestablishment of aquatic vegetation could change backwater sediment movement so that it follows a seasonal time scale in sync with flood events. Increased vegetation growth would trap sediment during the growing season, which would be removed by wave resuspension and advective transport during fall and spring highwater events when vegetation is dormant. The loss of bathymetric, biologic, and subsequently hydrodynamic diversity in backwater areas will limit future dynamic changes in backwater areas due to fine sediment transport. Instead of erosion and deposition zones, corresponding to local bathymetry or plant beds, flow will spread out across backwaters depositing sediment but lacking the energy to scour sediment.

Coarse sediment transport potential varies longitudinally with the upstream reach of the pool having a high transport potential, the downstream reach having a low transport potential, and the middle reach being a transition between the two regimes. Coarse sediments are transported through the upper reach to the middle reach where shoaling occurs due to the decreased transport potential because of increased loss of flow to secondary channels. Dredging occurs mainly in the middle transition reach, causing a reduction in sediment available to the lower reach. So even though sediment transport potential is lowest in the downstream reach, the sediment load has also been reduced, resulting in minimal channel dredging. Adjacent to the main channel, both island erosion and formation occurs, though erosion is the dominant process. In a few reaches of the Mississippi River, coarse sediment transport and hydrodynamic conditions are conducive to island formation. In pool 6, which has the lowest hydrodynamic connectivity, and is probably closest to dynamic equilibrium of any pool in the St. Paul District, island formation and loss is closer to equilibrium. Jefferson (1995) observed new islands being formed and older islands eroding away in Pool 6. In response to the flatter water surface slopes due to lock and dam construction, the new islands are lower in elevation, than the older islands.

The trend during the 60-years since inundation has been for increased hydrodynamic connectivity, at least under lower river discharges, as the number and size of secondary channels increased. Without manmade changes, this trend will continue as secondary channels continue to erode. Backwater deltas will continue to grow, affecting local scale bathymetry, however, impacts on backwater scale processes will be limited. Continued backwater delta expansion, and colonization of deltas by terrestrial plants will increase backwater flow resistance; resulting in

steeper water surface slopes, deeper channels, increased discharge in the navigation channel and increased transport of sand into lower pool reaches. The downstream movement of sand may be limited by channel dredging, however, coarse sediment will accumulate in the lower pools resulting in deltaic island growth in these areas.

5.7.2.2.3 Effects of Channel Maintenance Activities - Past, Present and Future (proposed CMMP)

Since the late 1880's, the use of channel training structures has further fixed the location of the main channel. The width of the main channel and main channel border within the St. Paul District has generally decreased, with the construction of the channel control structures and the impoundment by the locks and dams (Simons et al. 1981). The activities associated with the construction of the 4½-, 6-, and 9-foot channel had profound effects on the hydrodynamic conditions of the UMR floodplain. The Scientific Assessment and Strategy Team (SAST) concluded that "preliminary evidence suggests levees and channel training structures have influenced water levels at both the low and high levels of discharge" (SAST 1994). Future changes in river floodplain morphology will greatly influence the ecological characteristics of the UMR. Transport and deposition of fine and coarse sediments in an altered hydrologic regime will determine future floodplain morphology. Channel training structures have and will continue to have some degree of effect on river-flow and sediment transport.

Channel training structures affect the river at four different spatial scales. These are the local scale (e.g. near the training structure), the river reach scale (e.g. typically a 2 to 10 mile river reach with interdependent hydrodynamics), the navigation pool scale, and the floodplain scale (e.g. multiple pools).

The River and Harbor Acts of 1878 and 1907 authorized the development of 4½- and 6-foot channels respectively. These channel depths were achieved through dredging and the construction of wing dams, closing dams, and bank revetments on the UMR during the late 1800's and the early 1900's. The construction of training structures (wing dams, closing dams, and bank revetments) had significant impacts on the river at all four spatial scales. Locally, scour holes formed adjacent to wing dam tips and near the shoreline, and sediment deposition occurred in off-channel areas. Training structures caused the number and area of islands to increase, with a concurrent decrease in the surface area of the main channel (Chen and Simons et al. 1979). In pool 5A, Anderson et al. (1983) estimated that 45 percent of the total length of channel structures has been either buried or lost through erosion. This increased low flow velocities and caused erosion in the main channel. The construction of closing dams along with sediment accretions in off-channel areas reduced hydrodynamic connectivity affecting river reach and floodplain scale dynamics. In some places new secondary channels formed, increasing hydrodynamic connectivity between backwaters and the main channel.

The construction of locks and dams in the 1930's submerged most training structures, significantly changing their effect on river dynamics. On a local scale, the hydrodynamics around training structures continues to be complex. A scour hole usually developed at the tips of

wing dams and at notches in closing dams. Sediment accretion occurred between wing dams and adjacent scour holes. Many training structures provide local diversity and habitat (Pitlo in Burch et al. 1984).

On a river reach scale, the effects of training structures on river planform were reduced to varying degrees due to inundation. Nanda and Baker (1983) report that adequate training structures, submerged 3 to 5 feet below low water surface elevation, are effective. Generally, this means in the upper and middle reaches of pools training structures continue to affect reach specific hydrodynamics and sediment transport, to some degree. In the lower pools, training structures are more deeply submerged, and are less effective. If wing dams are submerged enough so that about 30-percent of the total main channel flow is conveyed over them, they are ineffective. In many instances, lower pool structures are buried in sediment.

Inundation also submerged closing dams and created new secondary channels, which increased hydrodynamic connectivity, making all training structures less effective. The increased hydrodynamic connectivity affects both backwater habitat and navigation channel dredging. Based on St. Paul District data, dredge cut location is correlated more closely with secondary channel flows than with training structure density.

On a navigation pool and floodplain reach scale, the effects of training structures are minimal for existing river conditions. River character at these scales is dominated by manmade features such as locks and dams and agricultural or flood control levees, post glacial river valley planform, and tributary locations.

Assuming no changes in pool operation or river planform, the impacts of existing training structures will continue to decrease. They will affect local bathymetry, will have varying effects on river reach specific hydrodynamics and sediment transport, but will continue to have minimal impacts on navigation pool and floodplain reach scale dynamics. With time, hydrodynamic connectivity will increase as new secondary channels form connections between the main channel and the backwaters. If pool operation is changed at some point in the future so that lower water levels occur for part of the year, the effects of training structures on pool scale and floodplain scale dynamics will increase.

Placement of dredged material prior to the mid-1970's, occurred in shallow backwater areas out of the main channel, on natural islands, or on newly created islands immediately adjacent to the main channel. Frequently dredge material was placed in the wing dam dike fields that were constructed as part of the 4½- and 6-foot channels, further constricting the main channel and main channel border. The placement of this dredged material impacted valuable acreages of productive fish and wildlife habitat. The Sediment and Erosion Work Group of the GREAT I study (GREAT I 1980) compared the loss of habitat from sedimentation versus dredge material placement and concluded that "fine sedimentation causing habitat degradation encompasses significantly more area than does dredged material placement." Long-term erosion of these historical placement sites will continue to adversely impact adjacent aquatic habitat.

Since the advent of GREAT I study, material has been more confined to selected areas, with more emphasis on removal of the material from the floodplain, avoiding more valuable fish and wildlife habitat, minimizing the foot print size, and incorporating erosion protection measures. The CMMP would continue this emphasis.

With the implementation of the CMMP approximately 32 million cubic yards of sediments would be removed from the system over the 40-year planning period. Of the total cubic yards removed, approximately 30 million would be bed load (sand and gravel) and 1.4 million would be wash load (silts and clays). Table 5-12 presents an estimate of the sediment loads (bed load and wash load) for pools lower pool 4 through 8 for what is considered a "normal" year, a 2-year annual hydrograph. The amount of sand that normally is removed from the system by dredging, compared to total inflows from upstream pools and tributaries is highly variable depending on location along the river. It can be very substantial, more than one third of the sand entering lower pool 4 from the Chippewa River is removed by dredging. Removal of this much of the bedload from the system, may be having both positive and negative effects on aquatic resources. It prevents this material from entering backwaters, thereby reducing the loss of these backwaters from sedimentation. However, it could also be starving the river for sediments in certain reaches leading to excess erosion.

The biological productivity of floodplain rivers depends in large part on the interaction between the channels and floodplain. Movement of water onto and from the floodplain transports sediment, organic materials, nutrients, and allows life to flourish in seasonally flooded habitats. Much of the floodplain of the UMR and Illinois Rivers has been isolated from the rivers by levees and converted to agricultural and other uses. Dredged material placement and secondary movement and structural modifications can contribute to the occlusion of backwater circulation channels. This can strongly influence sedimentation patterns, reducing current velocities and increasing the deposition of fine-grained sediments. Circulation to backwaters is also necessary to prevent stagnation conditions. Erosion protection measures have been incorporated into the CMMP to minimize secondary movement. In the future planning of channel control structures, the potential adverse impacts on water circulation and quality in backwaters and opportunities to enhance flow characteristics would be evaluated.

5.7.2.3 Cumulative Impacts on Water Quality

5.7.2.3.1 Effects of Watershed Use - Past, Present and Future

River conditions reflect the use of the basin's watershed. For centuries prior to the industrial revolution the watershed of the UMR was largely undisturbed. Vegetation on the highly productive soils of the watershed buffered and slowed runoff limiting erosion and minimizing the effects of the watershed on water quality.

With the advent of modern mechanized farming, ever increasing acreages of land were placed in production of row crops. Application of pesticides and fertilizers to ensure healthy and large yields became commonplace. The exposure of soils to the erosive forces of wind and rain greatly

Table 5-12. Sediment loads for lower pool 4 through 8.

Location	Loads for 2-year annual hydrograph - Tons/year unless otherwise specified											
	Total Load			Dredging - Volume			Dredging - Percent of total inflow			Outflow - %of inflow		
	Total	Sand	Fines	Total	Sand	Fines	Total	Sand	Fines			
Pool 4												
Inflow upstream of Chippewa	445,000	0	445,000									
Inflow from Chippewa	940,000	782,080	157,920									
Total Inflow	1,385,000	782,080	602,920	293,000	290,070	2,930	21.16%	37.09%	0.49%	84.04%	44.68%	135.10%
Outflow to pool 5	1,164,000	349,470	814,530									
Pool 5												
Inflow from pool 4	1,164,000	349,470	814,530									
Inflow from Zumbro	1,010,000	131,271	878,729									
Total Inflow	2,174,000	480,741	1,693,259	111,000	109,557	1,443	5.11%	22.79%	0.09%	52.25%	47.22%	53.68%
Outflow to pool 5A	1,136,000	227,010	908,990									
Pool 5A												
Inflow from pool 5	1,136,000	227,010	908,990									
Total Inflow	1,136,000	227,010	908,990	58,000	57,478	522	5.11%	25.32%	0.06%	101.41%	105.64%	100.35%
Outflow to pool 6	1,152,000	239,822	912,178									
Pool 6												
Inflow from pool 5A	1,152,000	239,822	912,178									
Trempleau River	684,000	0	684,000									
Total Inflow	1,836,000	239,822	1,596,178	20,000	19,500	500	1.09%	8.13%	0.03%	68.74%	124.00%	60.43%
Outflow to pool 7	1,262,000	297,375	964,625									
Pool 7												
Inflow from pool 6	1,262,000	297,375	964,625									
Black River	0	0	0									
Total Inflow	1,262,000	297,375	964,625	66,500	65,237	1,264	5.27%	21.94%	0.13%	116.40%	103.58%	120.35%
Outflow to pool 8	1,469,000	308,034	1,160,966									
Pool 8												
Inflow from pool 7	1,469,000	308,034	1,160,966									
LaCrosse River	519,000	0	519,000									
Root River	833,000	56,658	776,342									
Total Inflow	2,821,000	364,692	2,456,308	97,000	96,418	582	3.44%	26.44%	0.02%	51.58%	58.33%	50.58%
Outflow to pool 9	1,455,000	212,716	1,242,284									

NOTES:
Estimated loads taken from GREAT I Volume 4 Appendix B (1980), except for Chippewa River loads which were derived from Rose (1990)
To convert from tons to cubic yards divide tons by 1.27 to get cubic yards (assumes 94 lbs/cubic foot).

increased the quantities of topsoil, fertilizer and man-made chemicals found in runoff. Water quality declined.

Urbanization of the watershed has also contributed to declines in water quality. Impervious surfaces created by the construction of homes, roads, parking lots, etc. has increased the amount of runoff contributed by a once largely vegetated watershed. Fuels, oils, road salts, fertilizers and pesticides are now commonly washed into the river with runoff. Additionally, thermal pollution from urbanized watersheds contributes to water quality declines.

With the realization the health of the river is linked to the use of the watershed, best management practices to reduce the impacts of non-point sources of pollution are becoming increasingly common. Maintenance of grassed waterways and riparian corridors are reducing the impacts of runoff on water quality. Programs like CRP offer potential for continued reduction in topsoil erosion. Creation/restoration/preservation of wetlands for storage of runoff waters, both urban and agricultural are contributing to improved water quality.

5.7.2.3.2 Effects of Point Discharges - Past, Present and Future

Development of metropolitan areas along the UMR and tributaries had a very significant impact on water quality conditions. The status of UMR near metropolitan areas is evidenced by the following quote: "In 1888, the Engineers were called to remove a bar forming near the St. Paul waterfront. Dredging discovered that this bar was formed entirely of garbage dumped into the river by St. Paul. This area of the river had been shoaling for several years; the Corps was called in only when the smell became so objectionable that private citizens obtained an injunction against the governments of Minneapolis and St. Paul. Minneapolis dumped 500 tons of garbage a day just below the Falls of St. Anthony, and St. Paul added even more than that" (Tweet 1984). These gross contamination problems were gradually eliminated in the mid-1900's. However, even in the 1960's and early 1970's significant dissolved oxygen sags occurred in pool 2 because of the heavy organic loading from the Pig's Eye municipal sanitary treatment plant in St. Paul. Only the most pollution tolerant fish and benthic macroinvertebrates were able to survive these conditions. In addition, in the mid-1900's there was a rapid expansion of industries producing anthropogenic compounds, especially synthetic-organic chemicals. Eventually thousands of new chemicals were introduced into the water, without a good understanding of their fate in the environment. Many compounds, like DDT and PCB's, were in use for many years before the severity of the environmental consequences from their introduction into the natural environment were understood. However, with the passage of the water pollution-control laws in the early 1970's, significant reductions in point source loadings occurred, despite continued increases in population. This has resulted in a dramatic improvement in water quality conditions. However, the water quality of the river continues to be a major area of concern, as evidenced by the fact that certain reaches still do not meet their long-range goal to be fishable and swimmable and there continues to be human health consumption advisories on fish.

Although the release of toxic substances by point dischargers has been reduced, they continue to add to the load on the system, both from direct input and airborne sources. In addition, river

sediments, especially in once badly polluted areas like pool 2 and Lake Pepin, remain relatively contaminated. These sediments when re-suspended from flood waters; wind, commercial traffic, and recreational craft induced wave action; dredging; and biological activity (i.e., carp activities) can release chemicals back into the water. Therefore, problems with industrial chemicals will continue to persist into the future, both from past input and ongoing input.

5.7.2.3.3 Effects of Operation of the 9-Foot Channel Project - Past, Present and Future

Construction of the locks and dams converted the lower portions of each pool from flowing stream habitat into standing, shallow pools and marshes. Water quality changes associated with impoundment resulted from the accumulation of oxygen-demanding sediments in slack water areas and the reduction in aeration resulting from decreased surface turbulence. These factors led to decreased concentrations of oxygen, particularly in backwater sloughs which do not receive circulation from the main channel. With reduced flushing of the products of biochemical and anaerobic decomposition, sediments containing high concentrations of nitrate and phosphate also accumulated, affecting water quality. However, increased connectivity with backwaters which previously were isolated during the summer months likely improved water quality conditions in these locations.

Water quality in the open lower pool areas and the larger shallow lakes can be greatly affected by wind generated waves. Increased turbidity and suspended solids concentrations resulting from wave erosion of islands can substantially lower water quality. As islands are lost the effects of wind and wave action on water quality are increased.

Commercial and recreational navigation can also impact water quality. Waves produced by watercraft and prop wash can disturb bottom sediments and erode shorelines contributing to increased turbidity and suspended solids concentrations. Watercraft exhaust releases fuel and oil to the water column. Additionally, cooling water is a thermal pollutant.

Spills are potential sources of chemicals to the UMR. Millions of tons of hazardous material are carried through the region by barge, pipeline, trucks, and rail. These cargoes include crude oil, refined petroleum products, fertilizer, salt, paint, and caustic soda. Most toxic spills in the UMR in the past have been petroleum products and chemicals. So far most spills have been relatively small, less than 1,000 gallons.

5.7.2.3.4 Effects of Channel Maintenance Activities - Past, Present and Future (proposed CMMP)

Historical dredging practices were contributors to the degraded water quality conditions present since European settlement. As was pointed out earlier, the Corps was at times called upon to dredge garbage to maintain navigation. Unconfined or open water placement of dredged material was generally the standard practice until the late 1970's. With this general practice and the highly contaminated sediments, degradation of water quality occurred quite frequently. Water quality studies conducted in the 1970's found very minor to fairly substantial degradation of

water quality, depending on location and type of dredging and placement practices (GREAT 1978a; GREAT 1978b, Anderson, Whiting and Jackson 1981; Anderson, Whiting and Nosek 1981). Since the time of the GREAT I study, the effects on water quality from maintenance dredging has diminished. Sediment quality has improved. The amount of annual dredge material has been reduced and placement practices have been substantially altered. Presently there is only a very limited amount of open water placement and there is a greater reliance on mechanical dredging and placement of hydraulically dredged material in containment sites.

Implementation of the CMMP should produce similar impacts to those presently occurring which are summarized below. Removal or sequestering of nearly 32 million cubic yards of dredged material and associated contaminants from the floodplain or at in floodplain placement sites over 40 years could remove part of the contaminant burden from the system. However, this would have a minimal effect, because the majority of sediments dredged are coarse grained, with resulting low levels of contaminants. Finer sediments, which tend to have much higher levels of contaminants, usually deposit in over-bank areas or are carried through the system. Some of the dredge cuts in pool 2, the Minnesota River and the commercial and small boat harbors are notable exceptions, in that they contain finer grained sediments, are closer to known sources, and as a result have higher levels of contaminants. Dredging and disposal does not introduce new contaminants to the system. However, dredging and disposal can re-suspend contaminants that have become at least temporarily sequestered in the sediments. Normally these contaminants might only be resuspended during flood events, where rapid mixing, dilution, and transport would occur. Dredging and disposal can occur throughout the open water season, but frequently occurs during lower discharges, when the river has less assimilation capacity. However, based on water quality studies conducted by the St. Paul District and the Waterways Experiment Station of the U.S. Army Corps of Engineers, effluent discharges from hydraulic disposal sites are normally relatively short-term (lasting only a couple days) and do not contain any appreciable levels of contaminants.

The amount of silts and clays in dredged material is an indication of the potential for resuspension of solids when dredged and placed, especially hydraulically. Most contaminants have a tendency to associate with fine material; so the amount of silts and clays also indicate the potential for contaminant resuspension. The amount of fine material dredged annually from the system is quite variable depending on location on the river, but generally is a very small percentage of the normal wash loads in the system; typically less than 0.1 percent (Table 5-12). Pool 2 is a notable exception. Approximately two thirds of the fine material dredged annually from the main channel within the District is derived from pool 2. As a result, the potential for dredging causing localized water quality impacts is the greatest in pool 2. However, wash load is also very high in pool 2 because of the inputs from the Minnesota River. Important other factors causing resuspension of sediments include: wind/wave action, advective current, commercial and recreational craft, and biological activity (i.e., feeding waterfowl, carp activity, etc.). Wind/wave action can have a very significant effect on sediment resuspension (Sullivan and Anderson 1995; James and Barko 1995) especially in shallow, open areas of the pool. In Weaver Bottoms, a 4,000-acre shallow backwater lake in pool 5, wind/wave action was found to be a very significant factor affecting water quality (Sullivan and Anderson 1995). Using the data

from the Weaver Bottoms study, a 24-hour average wind of 10 miles or greater was calculated to resuspend 750 cubic yards of fine material; which is approximately equal the average annual amount of fine material dredged from pool 5 to maintain navigation (951 cubic yards).

Compared to the contribution of wash loads from the tributaries and other resuspension factors, dredging and placement with the implementation of the CMMP would have a very minimal impact on water quality from a system standpoint. However, local degradations in water quality, especially in pool 2, could be more substantial.

Past construction of channel structures probably had both beneficial and adverse impacts on water quality. Closing dams likely reduced the input of sediments to backwaters but also reduced the flow of oxygenated water to these areas. Wingdams increased mixing and surface turbulence which can increase oxygen exchange between water and air. Overall, the past effects of channel structures on water quality were probably very minor. The construction/rehabilitation of channel structures as proposed under the CMMP would probably result in only minor impacts on water quality.

5.7.2.4 Cumulative Impacts on Fish and Wildlife Resources

5.7.2.4.1 Effects of Watershed Use - Past, Present and Future

The conversion of large portions of the UMR watershed from native prairie and forest habitats to agricultural fields and urbanized areas has significantly affected fish and wildlife resources. Some species have benefitted while others have not. The general trend in agriculture toward large single crop fields is for the most part detrimental to wildlife. Additionally, many species are relatively intolerant or unsuited for living in close proximity of urban areas. Habitat diversity throughout the watershed has generally declined with associated declines in species diversity. However, some species, like whitetail deer and raccoon, which are relatively tolerant of urbanization and consume agricultural crops are thriving.

Urban development in the watershed is likely to continue and agricultural use of the productive soils is a must to the nation's economy, however, with continuation of programs like the Conservation Reserve Program and other conservation minded efforts, restoration of some habitat diversity is likely with resulting benefits to fish and wildlife. Additionally, our society is becoming increasingly cognizant of the need to preserve/create "greenbelts" or areas which are set aside for fish and wildlife uses.

5.7.2.4.2 Effects of Non-Indigenous Species

For centuries species of both plants and animals have been intentionally and unintentionally introduced into the UMR watershed. Examples of "good" introductions might include ring-necked pheasants and brown trout. Examples of "bad" introductions might include carp, purple loosestrife, eurasian watermilfoil, reed canary grass (see Section 5.10.2.4.5) and recently zebra mussels. The effects these species have on native or endemic flora and fauna are generally

adverse. Brown trout for example are known to displace native brook trout from spring-fed streams in the UMR watershed. Purple loosestrife is a robust wetland plant species which once established out competes native species eventually developing into a monotypic stand. Purple loosestrife has comparatively little value to fish and wildlife, and thus when native species are displaced fish and wildlife use declines.

Zebra mussels were detected in the UMR in 1991. With phenomenal reproductive capacity, zebra mussels rapidly colonize suitable substrates. Encrusting in layers up to 6 inches thick zebra mussels pose a significant threat to native species of bottom dwelling invertebrates. Additionally, zebra mussels are prolific filter feeders, out competing other species for food resources with resulting impacts to higher levels of the food chain.

The general effect of non-indigenous species is to supplant native species and reduce diversity. The zebra mussel has decimated the once healthy freshwater mussel populations of Lake Erie and the Detroit River, for example. Zebra mussels are projected to have the same impact on freshwater mussels in the UMR.

As our efficiency at transporting goods from other places of the world increases, the potential for unintentional introduction of harmful species increases. Some introductions may be viewed as good or beneficial, however, negative impacts to native species can be anticipated.

5.7.2.4.3 Effects of Operation of the 9-Foot Channel Project - Past, Present and Future

Construction of the 9-foot channel had a profound affect on river hydrodynamic conditions and significantly altered habitat conditions within the UMR floodplain. Initially productive with "new reservoir" vigor, the newly-inundated shallow aquatic and wetland areas of the UMRS floodplains supported an abundance of life following construction of the navigation dams. The total aquatic area within the St. Paul District increased (measured from 1929 to 1973) from 37 percent to 60 percent of the floodplain (Olson and Meyer 1976) following lock and dam construction. The resulting water complex created and maintained by the locks and dams established an abundance and diversity of high quality fish and wildlife habitat.

Since construction, major changes in the UMRs hydrodynamic regime, the geometry of the channels and floodplain, and the accompanying mosaic of riverine habitats have occurred. Sedimentation of shallow aquatic and wetland areas on the UMR is considered by many to be the greatest problem facing the river ecosystem. While retaining many of the attributes of an unregulated floodplain river system, the present-day UMR supports only scattered remnant patches of relatively undisturbed river habitats. Within the last 20 years the loss of islands from the lower lake-like portions of UMR pools, declines in aquatic vegetation and declines in bathymetric diversity have occurred.

Continued operation and maintenance of the navigation system will produce further changes to the condition of UMR floodplain and aquatic habitats. The combined effects of modifications to the UMR has been to reduce the extent, diversity, and dynamic character of UMR floodplain and

aquatic habitats. The biological diversity and abundance of fish and wildlife, including highly valued species, has declined as a result.

As a result of lock and dam construction, total terrestrial habitat within the St. Paul District decreased (measured from 1929 to 1973) from 60 percent to 37 percent of the floodplain (Olson and Meyer 1976). The greatest loss was in upland/wetland meadow habitat, which was reduced from 18 percent to 2.4 percent of the floodplain. Approximately 25 percent of the bottomland forest was lost, from clearing during navigation project construction and from inundation of terrestrial habitats. The navigation dams elevated floodplain groundwater levels. The increased elevation and duration of saturated soil conditions throughout much of the remaining emergent floodplain reduced the available rooting depth for trees and other vegetation. The increased wind fetches in the impounded areas of the navigation pools, coupled with the shallow rooting depth, have made floodplain trees vulnerable to wind throw. Many larger trees in wind-exposed areas such as islands have been lost. Dutch elm disease has nearly eliminated large elms, formerly common in the floodplain. The long duration of the 1993 flood caused considerable mortality to the floodplain forest trees in the southern reaches of the UMR. The floodplain vegetation on the UMR has been continuously adapting to these changed conditions since construction of the navigation dams. In addition to the changed water levels at the time of construction of the 9-foot channel, large amounts of land were also placed in Federal ownership as part of the UMR Refuge. As a result, much of the floodplain forest is maturing as a relatively even aged stand. Olson and Meyer (1976) indicate the loss of this age diversity, in 1929 approximately 20 percent of the floodplain forest was classified as brush or young floodplain forest, compared to approximately 5 percent in 1973. There is little or no forest reproduction because most floodplain tree species are not shade tolerant. There is growing concern that as some of these mature trees die, they are not being replaced by trees, but by reed canary grass which is a relatively aggressive non-native species with limited habitat value for fish and wildlife. The general projection for the future is that as the backwaters fill in with sediments, there will be an increase in terrestrial habitat, mainly wetland meadows and floodplain forest.

Prior to construction of the 9-foot channel project, the fishery of the UMR was largely dominated by riverine species adapted to a lotic, or flowing water environment. With construction of the project and creation of slow moving "backwater" and pool habitat, a shift in the fishery occurred. Lentic species, notably members of the centrarchid family, increased in abundance. In addition, there was probably an increase in fish biomass, roughly proportional to the area inundated by the damming, as evidenced in other systems (Alabaster 1985). The aging of the reservoirs created by the locks and dams will undoubtedly affect the composition of the fishery. As backwaters continue to fill with sediment, habitat for species adapted to lentic conditions will decline. Commercial traffic has had and will continue to have significant impacts on the fisheries of the UMR. Many of the studies identified as part of the Navigation Study (USACE 1994) are focusing on the effects of commercial traffic on fish including: impacts on fishing spawning habitat; impacts on adult fish use of the main channel/main channel border; navigation-related drawdown impacts upon larval fish and eggs; and vessel passage impacts on early life stages of fish. While the potential effects of navigation on fish and other aquatic resources have been relatively well defined, there is generally insufficient information to define the magnitude of

these impacts. The completion of these studies should provide a better perspective on the magnitude of these impacts under existing and predicted future increases in navigation traffic.

The freshwater mussel resources of the UMR have been greatly impacted by development in the UMR basin. Qualitatively new conditions for mussels were created by the 9-foot channel project's impoundment of significant stretches of the UMR (Fuller 1980). This introduced new problems for mussels, notably reduction of the movements of fishes that host parasitic mussel larvae and acceleration of sediment accumulation. Additionally, the accelerated sediment accumulation required maintenance dredging to maintain the channel which can directly affect mussels. However, maintenance of stable water levels is advantageous to freshwater mussels (Fuller 1980). Commercial mussel harvest, zebra mussels (see Section 5.7.2.4.2), and water quality can and have had significant effects on the UMR's mussel resources. Recreational craft can cause bank erosion and elevated suspended sediment levels through increased wave action, which can adversely affect mussels. Commercial navigation can also have a significant impact on the UMR's mussel resources. Potential impacts on mussels by navigation traffic include physiological stress from increased turbidity, current changes, and increased water velocities. These impacts can negatively impact mussel feeding, metabolism, growth rates, and reproduction. Physical effects to mussels may occur from direct contact with barges and barge tow propellers, especially during low water conditions. Host fish species may avoid areas heavily used by commercial traffic, reducing the likelihood of mussel colonization.

5.7.2.4.4 Effects of Channel Maintenance Activities - Past, Present and Future (proposed CMMP)

The Sediment and Erosion Work Group of the GREAT I study (GREAT I 1980) illustrated the loss of aquatic areas in pools 5 through 10 from 1939 to 1973 from dredged material placement. This loss is estimated to be around 1,342 acres for this 45-year time period.
Comparable figures over the 40-year planning horizon for the GREAT I plan and the CMMP are 115 and 39 acres, respectively. Olson and Meyer (1976) estimated the acreage of old dredged material/sand habitat present in pools 1 through 10 of the UMR, and the navigable portions of the Minnesota and St. Croix Rivers (Table 4-1). Based on these estimates approximately 4,200 acres of old dredged material/sand habitat, which for the purposes of this EIS has been defined as "disturbed floodplain habitat," are present in the floodplain of pools 1 through 10 of the UMR and the navigable portions of the St. Croix and Minnesota Rivers (Table 5-6).

The proposed CMMP plan would commit 213 acres of aquatic/wetland habitat, 292 acres of disturbed floodplain habitat and 360 acres of upland habitat to dredged material placement, essential converting these areas to sandy upland habitats. Implementation of the GREAT I plan, as recommended, would have committed 477 acres of aquatic/wetland habitat, 281 acres of disturbed floodplain habitat and 361 acres of upland habitat to dredged material placement. Of the upland acres impacted under the CMMP, approximately 568 acres are already substantially disturbed; a combination of old dredged material, disturbed terrestrial, and abandoned quarry habitat. The use of the upland sites under the CMMP would have very negligible cumulative impacts, other than maintaining their present disturbed conditions. Wetland losses above those

proposed under the CMMP would be mitigated according to established policy (see CMMP Appendix B). The loss of 213 acres of aquatic/wetland habitats from a UMR reach containing approximately 147,620 acres of open water aquatic and 123,705 acres of wetland habitats (Table 5-5 and 5-6) would have in absolute terms a very minor incremental cumulative impact that would be difficult to measure in any quantifiable manner other than in terms of lost acreage. However, on a local or in some cases regional basis, the impacts would be substantial or significant.

The loss of these 213 acres would occur over a 40-year period when the character of the UMR will also be changing. The pools of the UMR are in essence shallow reservoirs. As the system ages, the effects of sedimentation will become more and more apparent. Shallow open aquatic backwaters will fill in and convert to marsh and eventually to wooded habitats.

Over the next 40 years open aquatic habitat would be converted to marsh and forest. Most of the 213 acres of wetlands affected by the proposed actions are bottomland forest and marsh, the types of habitat which will probably increase over the next 40 years due to successional processes. The bottom line is that the cumulative impact of the loss of wetlands and aquatic areas to dredged material disposal would be masked by the much larger changes that will occur as a result of successional changes occurring within an aging reservoir system. The net cumulative impacts on fish and wildlife resources of implementation of the CMMP would be minor, on a broad scale.

Channel maintenance dredging is normally required and conducted in areas of shifting/shoaling bedload. The unstable substrates typically found in frequently dredged areas are generally inhospitable habitat for most aquatic species. As a result, the dredging action itself has only minor impacts on aquatic habitats and species usage of these habitats.

Dredging can result in the direct physical removal of aquatic invertebrates from dredge cut locations, and subsequent deposition at a disposal site. Species such as freshwater mussels, in addition to being susceptible to local extermination, can be affected by turbidity, intake of resuspended pollutants, direct coverage by settling sediments produced during the dredging process, and reduced oxygen levels. Suspended solids and sedimentation due to dredging can cause clogging and abrasion of gills and other respiratory surfaces in filter feeders like freshwater mussels. The instability of substrates found in frequently dredged areas is normally unsuitable for colonization by most freshwater mussel species. However, in some locations, continual dredging probably prevents the establishment of mussel beds. For the most part, dredging usually has little impact on freshwater mussels.

Under the CMMP dredging would disturb an estimated 2,988 acres of main channel habitat. An estimated 147,620 acres of aquatic habitat exists in the St. Paul District's portion of the UMR and the navigable portions of the Minnesota and St. Croix Rivers. Excluding the USAF and LSAF pools, approximately 8.4 percent (12,356 acres) is classified as main channel habitat. The CMMP would disturb substantial portions of the main channel habitat present in most pools. In total, 24.2 percent of the main channel habitat would be disturbed by CMMP. However, only 2.0

percent of the total aquatic habitat present would be disturbed under the CMMP. As a result, on a system-wide basis the impacts of dredging on aquatic habitat would be minor, however, a substantial amount of main channel habitat would be disturbed.

Under the 4½- and 6-foot channel projects many wingdams, closing dams, longitudinal dikes and bank revetments were constructed with the goal of increasing the hydraulic efficiency of the main channel to provide adequate and reliable depths for navigation. These channelization efforts probably affected fish and wildlife resources through changes in habitat conditions. Main channel velocities were likely increased as a result of channelization. A deeper main channel was probably incised as a result of increased velocity and scour in the main channel. Some isolation of backwaters and adjacent floodplain habitats probably was initiated. Without further intervention in the hydrodynamics of the river the channelization efforts could have resulted in a river environment similar to that which exists on the Missouri River, where a deep, high velocity main channel, isolated from its floodplain exists. However, with construction of the locks and dams and the impounding of the river, the effectiveness of many of the structures was reduced and the connection between the floodplain and main channel restored. With impoundment brought on by the 9-foot channel project most of the channel structures were submerged which created a new hydrodynamic for the river environment. Behind many wingdams deep scour holes formed providing habitat for fish species. Closing dams which previously isolated backwaters now were overtopped allowing water to flow to backwaters and preventing bedload sediments from entering. Many of the structures have been in place for 60 years and have experienced deterioration. While the structures themselves are not solely responsible for maintenance of the 9-foot channel, in many places channel structures are needed for this purposes. However, in general channel structures contain the main channel of the river and slow or prevent scouring/sedimentation in many of the secondary channels and backwaters. Structures have reduced the rate at which habitats would be rejuvenated and formed under a natural hydrodynamic condition.

Control structure maintenance and modifications would have both beneficial and adverse impacts on fish and wildlife habitats and resources. These effects would continue into the future. In planning for channel control structure management four goals would be used in the planning effort: 1. Reduce and/or control dredging requirements; 2. Reduce cost and environmental effects; 3. Restore natural river processes; and 4. Restore and enhance habitat quality and diversity. Future planning using these four goals should reduce the cumulative impacts of channelization. However, the cumulative impacts would be analyzed on a case by case basis, when more specific information is available.

5.7.2.5 Archeological and Historic Resources

5.7.2.5.1 Introduction - Past, Present and Future

Development in the UMR valley is having and will continue to have a significant effect upon archeological resources. Therefore, we must carefully weigh the added impact of channel maintenance activities. It is critical to consider cumulative impacts to archeological and historic

resources because these resources are non-renewable. Once sites or portions of sites have been destroyed, information from these resources is lost for ever. A finite number of archeological sites exist within the UMR valley. While the loss of a single site may not greatly affect the total number of resources available, each site lost reduces the future prospect for understanding the larger nature of prehistoric and historic cultural development in the river valley.

5.7.2.5.2 Effects of Navigation Improvements - Past, Present and Future

One of the greatest impacts to sites within the UMR valley has been the development and maintenance of a navigable channel. Since 1866, the Corps has been actively changing the river and its valley for commercial navigation. Early dredging and snagging under the 4½-foot project (1866-1877) probably had little effect. But channel constriction, under the 4½- and 6-foot channel projects (1878-1930), likely contributed to the loss of many sites. Channel constriction represented the first intrusive effort to reshape the UMR. Wing dams and closing dams and shore protection often required reshaping the river's banks. Sometimes the Engineers encouraged bank erosion to eliminate difficult points and troublesome islands. This work undoubtedly affected archeological sites.

The 9-foot channel and the resulting permanent inundation of some floodplain lands created a new set of effects. Some low lying sites, which the river had seasonally inundated before the dams, are now permanently inundated. As a result, some shoreline sites are subject to greater erosion, from wind and from commercial and recreational boats. Many islands, especially in the waters just upstream of the dams, are disappearing due to erosion. Shoreline surveys have found sites washing into the river. Dredging and dredged material disposal, beach enhancement, more recent channel structures and harbor development have all affected archeological and historic sites. As long as these activities continue, the potential to steadily degrade cultural resources exists.

5.7.2.5.3 Effects of Urban Development - Past, Present and Future

Population growth in the upper UMR valley has affected archeological sites in urban areas and rural areas. While many small cities in the upper UMR valley have stable populations, cities like La Crosse, Wisconsin, and Winona, Minnesota, are growing rapidly. La Crosse and its surrounding lands hold large numbers of archeological sites. Urban expansion has destroyed and will continue to destroy many of these sites.

5.7.2.5.4 Effects of Agricultural Development - Past, Present and Future

Agricultural uses of the UMR's floodplains and upland terraces have destroyed important archeological and historical sites. Native Americans once used the fertile lands of the floodplain and the terraces just above it for their villages and agricultural fields. Subsequently, American settlers and farmers used these lands for agriculture. The placement of some agricultural lands into CRP and into green spaces will preserve cultural resources that have been deeply buried and

may not have been disturbed by agricultural activities to date. As long as agricultural crops are grown in the UMR valley, archeological and historical sites will be lost.

5.7.2.5.5 Effects of Flooding - Past, Present and Future

While archeological and historic sites in the floodplain have withstood many floods over the course of their existence, flooding can erode archeological sites and damage or destroy historic standing structures. With each flood, we lose cultural resources.

5.7.2.5.6 Effects of Channel Maintenance - Past, Present and Future (proposed CMMP)

Dredging, dredge disposal, harbor development maintenance, beach nourishment and development, and the construction of channel training structures all have the potential to add to the depletion of the cultural resources base in the UMR valley. The extent to which implementation of the CMMP will add to the incremental loss of cultural resources over the next 40 years is difficult to determine. Until we have completed the coordination and surveys needed for all the proposed sites under GREAT and the CMMP, we cannot draw a definitive conclusion. At this time, however, the number of known sites affected by sites proposed under the CMMP is small and not much different from GREAT.

As discussed in Sections 3 and 5 of this document, cultural resources laws and regulations establish clear procedures for the identifying, evaluating, and, if necessary, mitigating cultural resources. For the foreseeable future, these will define how the Corps approaches its cultural resources assessments for activities related to the operation and maintenance of the UMR. Under its Historic Properties Management Plan (HPMP), a draft of which is in preparation, the District is preparing a Programmatic Memorandum of Agreement (PMOA). These documents will deal with the effect of operation and maintenance activities on cultural resources. The HPMP examines the nature and extent of cultural resources in the UMR valley, and the PMOA will detail the historic preservation steps that the Corps will undertake for operation and maintenance activities. The PMOA will be developed in consultation with numerous parties, including Indian tribes and the State Historic Preservation Offices of Iowa, Minnesota and Wisconsin, and the Advisory Council on Historic Preservation.

5.7.2.6 Economic and Social Resources

5.7.2.6.1 Effects of Watershed Use - Past, Present and Future

River resources have played a fundamental role in shaping the development of society and the economy in the UMRS watershed from prehistoric times to the present. Rivers have played an important part in early settlement, and have increased in their importance as various technologies have allowed greater utilization of river resources. Important uses include transportation, water supply, power generation, effluent discharge, and recreation. Growth in the regional population has increased these dependencies.

While the use of river resources has yielded many benefits to society, it has also been damaging to the natural environment. Some of these impacts have, in turn, had negative effects on society, for instance in health, safety, and recreation (i.e., fish consumption warnings). Social values regarding the importance of environmental quality continue to evolve and to shape the decisions made regarding the use and care of the region's river resources.

5.7.2.6.2 Effects of Operation of the 9-Foot Channel Project - Past, Present and Future

Continued operation of the navigation system generates significant transportation benefits realized throughout the national economy. The continued operation and maintenance of the 9-foot navigation channel contributes to the long-term productivity of the region and the nation by permitting the economic advantages of low cost waterborne transportation. The UMR navigation system is an important segment of the entire multi-modal transportation network of the Upper Midwest region of the U.S. It expands the ability of regional shippers and producers to reach national and global markets. Maintaining navigability of the 9-foot channel allows for the movement of bulk commodities at considerable savings to shippers over alternative transportation modes. During a typical navigation season in the St. Paul District, the navigation system generates transportation cost savings benefits on the order of $150 - $200 million. The efficiency of waterborne commerce would foster continued or expanded economic development of cities and industries along the UMR.

5.7.2.6.3 Effects of Channel Maintenance Activities - Past, Present and Future (proposed CMMP)

A major component of the CMMP that affects economic and social resources is the dredge material placement program. Local site-specific impacts of this program on economic and social resources range from substantially negative to substantially positive. Social parameters affected adversely by dredge material placement sites include noise levels, visual aesthetics, land use compatibility, and the social controversy that accompany each. Those effects are limited primarily to the period when dredging occurs and are not likely to result in substantial cumulative effects.

Noise levels can be particularly bothersome at sites near residential or recreational areas during construction periods. Noise created by heavy equipment handling the material on-site and transporting it away for beneficial use elsewhere can interfere with the social well-being of nearby residents or the recreational experience of those on land or on the water preferring quieter surroundings. Although at isolated times and locations, noise related to handling of dredged material can be significant, the CMMP is considered to have a minor adverse affect on noise level on a project-wide basis.

Dredge placement sites also have a generally adverse affect on the aesthetic environment of the river. About one-quarter of the placement sites have visual aesthetic concerns associated with them. Most of these are minor in nature, but some are significant. Dredge material piles at one site, for instance, would block the view of the river for some of the town's residents. At other

sites the appearance of dredge material piles appreciably degrades the quality of the overall view. On a project-wide basis, the impact of the CMMP on the river's visual aesthetic environment is considered a substantially adverse impact.

Land use compatibility is another concern with many of the placement sites. The type of activity associated with a dredge disposal site involving the use of heavy equipment and the storage of dredge material may not be compatible with adjacent uses. This conflict leads to public safety concerns and recreational impacts for sites near marinas, boat ramps, hiking trails, and residential areas.

Sites located within the floodplain may not be compatible with floodplain uses. In the event of flooding, material from the site can be washed downstream and be deposited on land when flood waters recede or in low spots in the river. Post-flood cleanup or further dredging would be required to remove this material. Of the 49 permanent disposal sites selected as part of the CMMP, 26 are described as having adverse impacts due to their location within the floodplain. In addition, each of the eight emergency disposal sites and 17 transfer sites possess adverse floodplain characteristics. Given their nature though as temporary holding facilities, floodplain impacts at these sites are considered minor. On a project-wide basis, the impact of the CMMP on existing and potential land use is considered somewhat negative.

Implementation of either the CMMP or GREAT I placement site plans or structural modifications would reduce future recreational opportunities because the number of beaches will be reduced over time. Many of the beach areas that were formed by historical disposal practices are now being lost because of erosion and/or vegetative re-colonization, and they are no longer considered practical to maintain. This future loss of recreational use opportunities would be partially offset through future planning efforts to systematically develop and/or maintain recreational beaches.

Dredge material placement sites may also generate positive economic and social impacts. Benefits arise when material that otherwise may be considered waste and a nuisance, can be used for beneficial purposes. At about half of the permanent sites, all material placed will either be removed or used on-site for beneficial use. At an additional 35 percent of the sites, a portion of the material (30 - 80 percent) is expected to be used for beneficial purposes. On-site beneficial uses include maintenance and nourishment of beaches and open areas adjacent to the river. They may also include the development of commercial/industrial property or public facilities such as parks and boat ramps. Although at individual sites, impacts are judged as negligible to minor, collectively the CMMP is deemed to affect the river's recreational opportunities and resources in a substantially beneficial way.

5.8 COMPLIANCE WITH OTHER LAWS AND STATUTES

Table 1-1 in section 1 lists the applicable environmental protection statutes and executive orders affecting the CMMP. In the final EIS, the status of compliance for several acts/orders are listed as only partial. Full compliance with these acts/orders has been or will be achieved at the signing of the Record of Decision.

Clean Water Act: Included as Appendix D of this document is a Section 404(b)(1) evaluation for placement of fill materials in waters or wetlands of the United States. The 404(b)(1) evaluation was prepared in compliance with the Clean Water Act. The status of applicable State permits and certifications are listed in Table 5-13. The shaded areas in Table 5-13 indicates that endorsement/permits/certifications for the use of these sites have not been received at this point in planning.

Full compliance with the Clean Water Act would be achieved upon completion of the public review process and issuance of any remaining water quality certifications by the appropriate State agencies.

Fish and Wildlife Coordination Act: The USFWS and the State resource agencies have been involved in the channel maintenance management planning since the completion of the GREAT I process, via the Onsite Inspection Team and River Resources Forum (formerly Channel Maintenance Forum). Most of the individual site-specific plans have been endorsed by GREAT I or by the River Resources Forum (see Table 5-13). Final endorsement is being held until the review of the final EIS is completed.

Floodplain Management (Executive Order 11988): Dredged material placement sites are located outside the floodplain to the extent practicable. Existing technological and economic constraints preclude the possibilities of having all placement sites outside of the floodplain. Nearly 50 percent of the projected 40-year dredged material quantity is expected to be removed from the floodplain. Another 25 percent of the material is projected to be used beneficially within the floodplain, such as the Weaver Bottoms Rehabilitation and the Blackhawk Park development projects.

Tables 5-14 and 5-15 provide checklists of further actions that will be required prior to implementation of site-specific plans in the CMMP. This does not include any proposed actions listed in Section 1.5 *Further Studies*.

Table 5-13. Endorsement/State permit status for dredged material placement sites for the CMMP.

Location	GREAT Site #	Site Name	Interagency Endorsement Status	State Pemits/Certifications WDNR MOU	MDNR Prot. Waters	MPCA 401	IDNR 401/permits
MN-13.5-RMP	MN.03	Cargill	GREAT		May 1996	Conditional	
MN-12.1-RMP	-	Kraemer Site			May 1996		
MN-10.1-RMP	-	NSP Site			May 1996		
MN-7.3-RMP	-	Hwy. 77 Bridge			May 1996		
SC-6.7-LWP	SC.13	Kinnickinnic Bar Upper	GREAT	MOU-May 1996			
SC-6.5-LWP	SC.12	Kinnickinnic Bar Lower	GREAT	MOU-May 1996			
U-856.6-RMP	-	USAF Site			May 1996		
1-853.2-LMP	1.01A	Pool 1 Site	RRF - 3/84		May 1996	Conditional	
1-851.3-LME	1.07T	Below Franklin Avenue	GREAT - RRF - 3/84		May 1996	Conditional	
1-849.5-RME	1.03T	Below Lake Street	GREAT - RRF - 3/84		May 1996	Conditional	
2-840.4-RMP	2.16	Highbridge	GREAT		May 1996	Conditional	
2-838.2-RMP	2.15	Northport	GREAT - Filled 1970's				
2-837.5-RMP	2.40	St. Paul Barge Terminal	GREAT				
2-836.8-RMP	2.14	Holman Field	GREAT, conditional		May 1996	Conditional	
2-836.3-RMP	2.13	Southport	GREAT		May 1996	Conditional	
2-824.1-LMT	2.25T	Pine Bend			May 1996		
2-823.8-RMP	-	C.F. Industries	OSIT - 9/94 RRF - 4/96		May 1996	Conditional	
2-822.5-LMP	-	Shiely Pit			May 1996		
2-821.5-LMT	-	Upper Boulanger			May 1996		
2-821.1-LMT	2.31T	Lower Boulanger			May 1996		
3-815.1-RME	-	Hastings	RRF - 4/90		May 1996	Conditional	
3-814.7-RMP	-	Koch			May 1996		
3-813.2-RMP	3.46	Hastings Harbor	GREAT		May 1996	Conditional	
3-811.5-LMP	3.34	Point Douglas	GREAT		May 1996	Conditional	
3-808.4-LWP	3.27	Dry Run Slough	GREAT	MOU-May 1996			
3-802.3-RME	3.14T	Morgans	GREAT		May 1996	Conditional	
3-801.7-LWE	3.12T	Coulters	GREAT	MOU-May 1996			
3-800.0-LWP		County Gravel Pit					
3-799.2-RMT	3.07	Corps Island	RRF - 4/96		May 1996	Conditional	
3-798.0-LWP		Private Gravel Pit					
4-794.7-RMP	4.63	Red Wing Yacht Club	GREAT, RRF -11/85		May 1996	Conditional	
4-791.6-RMP	4.57	Red Wing Commercial Harbor	GREAT, RRF -11/85		May 1996	Conditional	
4-788.5-RMP	4.47	Colvill Park	GREAT		May 1996	Conditional	
4-762.7-LWT	4.29T	Reads Landing	GREAT, RRF - 4/82	MOU-May 1996			
4-761.1-RMP	4.25	Carrels Pit	GREAT		May 1996	Conditional	
4-761.0-RMP	4.24	Wabasha Gravel Pit	GREAT, RRF - 4/82		May 1996	Conditional	
4-760.2-RMP	MDNR.2	MDNR.2	RRF - 10/83		1987	1987	
4-759.5-RMP	4.19		GREAT		1987	1987	
4-759.3-RMP	4.17		RRF - 10/83		1987	1987	
4-759.3-LWT	4.16T	Crats Island	RRF - 3/83, 11/85	MOU-May 1996			
4-757.5-LW	4.13T	Teepeeota Point	GREAT, RRF - 6/83	MOU-May 1996			
4-756.5-LWT	4.10T	Grand Encampment	GREAT, RRF - 6/83	MOU-May 1996			
4-754.0-LWP	4.02	Alma Marina	GREAT, RRF - 6/83	MOU-May 1996			
5-749.8-RMP	5.24	West Newton Chute	GREAT, RRF - 10/83		May 1996	Conditional	
5-748.0-RMT	5.18T	Above West Newton	GREAT		May 1996	Conditional	
5-745.8-RMT	5.12T	Above Fisher Island	GREAT, RRF - 9/85		May 1996	Conditional	
5-744.7-LWT	5.08T	Lost Island	RRF 3/83, 9/85	MOU-May 1996			
5-744.0-RMP	5.30	Weaver Bottoms	GREAT, RRF - 9/85		1986	Conditional	
5A-738.2-RMP	5A.36	L/D 5 Site	GREAT, RRF - 6/83		May 1996	Conditional	
5A-734.5-LWE	5A.14T	Island 58	GREAT, RRF - 12/86	MOU-May 1996			

Table 5-13. Endorsement/State permit status for dredged material placement sites for the CMMP.

Location	GREAT Site #	Site Name	Interagency Endorsement Status	State Pemits/Certifications WDNR MOU	MDNR Prot. Waters	MPCA 401	IDNR 401/permits
5A-733.5-LWP	5A.34	Fountain City Service Base	RRF - 12/86	MOU-May 1996			
5A-731.9-LWP	5A.25	Fountain City 1	GREAT, RRF - 10/83	MOU-May 1996			
5A-731.8-LWP	5A.32	Fountain City 2	GREAT, RRF - 10/83				
5A-730.5-LWT	5A.08T	Wilds Bend	GREAT, RRF - 3/84	MOU-May 1996			
6-726.3-RMP	-	Winona Commercial Harbor			May 1996		
6-726.0-LMP	6.27	Winona Small Boat Harbor	GREAT		May 1996	Conditional	
6-720.5-RMP	6.11	Homer	GREAT		May 1996	Conditional	
7-714.1-LWP	7.06	Trempealeau	GREAT, RRF - 3/84	MOU-May 1996			
7-713.1-RMP	7.05	Hot Fish Shop	GREAT, RRF - 3/84		May 1996	Conditional	
7-708.7-LWE	7.11T	Winters Landing	GREAT	MOU-May 1996			
7-707.3-RMP	7.25A	Dakota Boat Ramp	RRF - 3/84, 6/86		May 1996	Conditional	
7-706.5-RMT	7.12T	Dakota Island	GREAT, RRF - 6/86		May 1996	Conditional	
8-695.7-LWP	8.06	Isle La Plume	GREAT, RRF - 10/83	MOU-May 1996			
8-690.4-LWT	8.17T	Above Brownsville	GREAT	MOU-May 1996			
8-688.7-RMP	8.30	Brownsville Containment	GREAT, RRF - 3/84		May 1996	Conditional	
9-677.7-LWP	9.15	Genoa Power Plant	GREAT, RRF - 6/86	MOU-May 1996			
9-670.5-LWP	9.55	Blackhawk Park	RRF - 6/86	MOU-May 1996			
9-665.8-RIE	9.18T	Indian Camp Light	GREAT				Annual - Yes
9-664.3-RIT	9.17T	Lansing	GREAT				Annual - Yes
9-663.5-LWP	9.50T	Lansing Highway Bridge	RRF - 12/92	MOU-May 1996			
10-647.1-LWP	10.17	Varo Property	GREAT, RRF - 9/85	MOU-May 1996			
10-644.5-RIE	10.22T	Jackson Island	GREAT				Annual - Yes
10-643.5-RIT	-	Jackson Rehandle	RRF - 9/85				Annual - Yes
10-642.4-LWP	10.40	Mississippi Gardens	GREAT, RRF - 9/85	MOU-May 1996			
10-635.0-LWP	10.43	Prairie Muncipal Dock	RRF - 4/82	MOU-May 1996			
10-628.0-LWP	10.01	Wyalusing Pit	GREAT, RRF - 9/85	MOU-May 1996			
10-627.8-LWP	10.24	Wyalusing Beach	RRF - 9/85	MOU-May 1996			
10-618.7-RIT	10.18	McMillan Island	RRF - 9/95				Annual - Yes
10-618.0-RIP	-	Buck Creek	RRF - 9/95				Annual - No

NOTES:
RRF = River Resources Forum; GREAT = Great River Environmental Action Team
Wisconsin Department of Natural Resources (DNR) Memorandum of Understanding (MOU) - In accordance with Wisconsin Statutes (section 30.202), the Corps and WDNR enter into an MOU concerning dredge material placement on the UMR.
IOWA DNR issues certification on a case by case basis - the "yes" note indicates that certification has been recieved in the past for use of these sites
Minnesota Pollution Control Agency (MPCA) issues a long-term certification, but it is not site-specific. Conditional Approval is given to GREAT or RRF endorsed sites. However, MPCA still requires approval on a case by case basis.
The shaded boxes indicate where resolution on State permits are still required for the individual sites.

Table 5-14. Checklist of further actions that will be required prior to implementation of CMMP placement sites, not including recreation beaches.

Location	GREAT Site #	Site Name	Further Federal Endangered Species Coordination*	Further Cultural Resources Work	Additional Groundwater Investigation	Floodplain Impact Assessment	Real Estate Acquistion or Agreement	Change in Land Use Allocation
MN-13.5-RMP	MN.03	Cargill		Coordination			Local Sponsor	
MN-12.1-RMP	-	Kraemer Site		Coordination		Yes	Local Sponsor	
MN-10.1-RMP	-	NSP Site		Coordination		Yes	Local Sponsor	
MN-7.3-RMP	-	Hwy. 77 Bridge		Coordination		Yes	Local Sponsor	
SC-6.7-LWP	SC.13	Kinnickinnic Bar Upper		Coordination			Permit	
SC-6.5-LWP	SC.12	Kinnickinnic Bar Lower		Coordination			Permit	
U-856.6-RMP	-	USAF Site		Coordination			Permit	
1-853.2-LMP	1.01A	Pool 1 Site					Local Sponsor	
1-851.3-LME	1.07T	Below Franklin Avenue					Local Sponsor	
1-849.5-RME	1.03T	Below Lake Street					Local Sponsor	
2-840.4-RMP	2.16	Highbridge		Coordination		Yes	Permit	
2-838.2-RMP	2.15	Northport				Project Completed		
2-837.5-RMP	2.40	St. Paul Barge Terminal	Mussels	Coordination		Yes	Agreement	
2-836.8-RMP	2.14	Holman field				Project Completed		
2-836.3-RMP	2.13	Southport				Yes	Permit	
2-824.1-LMT	2.25T	Pine Bend				Yes	Acquisition	
2-823.8-RMP	-	C.F. Industries		Survey		Yes	Permit	
2-822.5-LMP	-	Shiely Pit		Survey	Yes		Permit	
2-821.5-LMT	-	Upper Boulanger				Yes	Acquisition	
2-821.1-LMT	2.31T	Lower Boulanger		Survey		Yes	Acquisition	
3-815.1-RME	-	Hastings		Coordination				
3-814.7-RMP	-	Koch		Coordination			Permit/Acquisition	
3-813.2-RMP	3.46	Hastings Harbor				Yes	Acquisition	
3-811.5-LMP	3.34	Point Douglas		Coordination			Acquisition	
3-808.4-LWP	3.27	Dry Run Slough		Survey			Acquisition	
3-802.3-RME	3.14T	Morgans	Eagle	Coordination		Yes		Yes
3-801.7-LWE	3.12T	Coulters					Acquisition	
3-799.2-RMT	3.07	Corps Island		Coordination		Yes		Yes
3-798.0-LWP		County/Private Gravel Pit			Yes		Permit/Acquisition	
4-794.7-RMP	4.63	Red Wing Yacht Club	Eagle				Permit/Acquisition	
4-791.6-RMP	4.57	Red Wing Commercial Harbor		Coordination			Permit	
4-788.5-RMP	4.47	Colvill Park	Eagle			Yes	Permit/Acquisition	
4-762.7-LWT	4.29T	Reads Landing						
4-761.1-RMP	4.25	Carrels Pit			Yes		Acquisition	
4-761.0-RMP	4.24	Wabasha Gravel Pit			Yes			
4-760.2-RMP	MDNR.2	MDNR.2				Project Completed		
4-759.5-RMP	4.19					Project Completed		
4-759.3-RMP	4.17					Project Completed		
4-759.3-LWT	4.16T	Crats Island						
4-757.5-LWP	4.13T	Teepeeota Point	Eagle					
4-756.5-LWT	4.10T	Grand Encampment						
4-754.0-LWP	4.02	Alma Marina						Yes
5-749.8-RMP	5.24	West Newton Chute		Nat Reg Assess				
5-748.0-RMT	5.18T	Above West Newton						
5-745.8-RMT	5.12T	Above Fisher Island						
5-744.7-LWT	5.08T	Lost Island						
5-744.0-RMP	5.30	Weaver Bottoms						
5A-738.2-RMP	5A.36	L/D 5 Site		Coordination				
5A-734.5-LWT	5A.14T	Island 58					Permit	Yes
5A-733.5-LWP	5A.34	Ft. City Service Base						Yes
5A-731.9-LWP	5A.25	Fountain City 1						
5A-731.8-LWP	5A.32	Fountain City 2			Yes		Permit/Acquisition	
5A-730.5-LWT	5A.08T	Wilds Bend						
6-726.3-RMP	-	Winona Commercial Harbor		Coordination			Permit	
6-726.0-LMP	6.27	Winona Harbor					Permit	
6-720.5-RMP	6.11	Homer		Coordination	Yes	Yes	Permit/Acquisition	
7-714.1-LWP	7.06	Trempealeau		Coordination				
7-713.1-RMP	7.05	Hot Fish Shop		Coordination			Permit/Acquisition	
7-708.7-LWE	7.11T	Winters Landing						Yes
7-707.3-RMP	7.25A	Dakota Boat Ramp		Further Testing	Yes		Permit/Acquisition	
7-706.5-RMT	7.12T	Dakota Island						Yes
8-695.7-LWP	8.06	Isle La Plume					Permit	
8-690.4-LWT	8.17T	Above Brownsville						
8-688.7-RMP	8.30	Brownsville Containment						
9-677.7-LWP	9.15	Genoa Power Plant					Permit	
9-670.5-LWP	9.55	Blackhawk Park					Acquisition	
9-665.8-RIE	9.18T	Indian Camp Light						Yes
9-664.3-RIT	9.17T	Lansing						
9-663.5-LWP	9.50T	Lansing Hwy Bridge						Yes
10-647.1-LWP	10.17	Varo Property		Survey	Yes		Acquisition	
10-644.5-RIE	10.22T	Jackson Island		Survey				Yes
10-643.5-RIT		Jackson Rehandling Site	Mussels	Survey				
10-642.4-LWP	10.40	Mississippi Gardens	Eagle	Survey			Acquisition	
10-628.0-LWP	10.01	Wyalusing Pit			Yes		Permit/Acquisition	
10-627.8-LWP	10.24	Wyalusing Beach	Mussels	Coordination			Permit	
10-635.0-LWP	10.43	Prairie Municipal Dock					Permit	
10-618.7-RIT	10.18	McMillan Island		Surveyed				Yes
10-618.0-RIP	-	Buck Creek		Surveyed		Yes	Acquistion	

* Changed conditions could cause additional endangered species coordination to be required at any of the proposed placement sites.

Table 5-15. Checklist of further actions that will be required prior to implementation of dredging, snagging and recreational beach development.

Pool	Site/Cut Name	Location (river mile)	Further Federal Endangered Species Coordination*
	*** Main Channel Dredging ***		
MN	Above 35W Bridge	10.1	Mussels
MN	4-Mile Cut-Off	4.0	Mussels
SC	Kinnickinnic Bar	6.0 - 6.5	Mussels
1	Washington Avenue Bridge	852.5 - 853.0	Mussels
1	Upper Approach to L/D 1	847.7 - 848.4	Mussels
2	Robinson Rocks	826.1	Mussels
3	Prescott	810.3 - 811.7	Mussels
3	Truedale Slough	807.9 - 808.6	Mussels
3	Four Mile Island	807.0 - 807.9	Mussels
4	Trenton	794.0 - 794.6	Mussels
4	Above Red Wing High Bridge	790.8 - 791.2	Mussels
4	Below Red Wing High Bridge	789.5 - 790.3	Mussels
5	Lower Approach L/D 4	752.6 - 752.8	Mussels
5A	Island 58	734.0 - 735.2	Mussels
5A	Fountain City	733.3 - 733.8	Mussels
6	Gravel Point	721.8 - 722.9	Mussels
7	Richmond Island	711.4 - 712.3	Mussels
7	Upper Approach to L/D 7	702.5 - 702.9	Mussels
8	Sand Slough	694.3 - 695.0	Mussels
8	Picayune Island	691.4 - 692.4	Mussels
8	Deadman's Slough	686.5 - 687.5	Mussels
9	Lower Approach to L/D 8	678.7 - 679.2	Mussels
9	Twin Island	676.0 - 676.6	Mussels
9	Battle Island	671.0 - 672.0	Mussels
10	Hay Point	646.0 - 646.6	Mussels
10	Jackson Island	643.7 - 644.7	Mussels
10	Mississippi Gardens	642.7 - 643.4	Mussels
10	Wyalusing	627.3 - 628.0	Mussels
Various	New Cuts or New Sediment Traps	Undetermined	Mussels
	*** Recreational Beach Development ***		
3	3-805.5-RM	805.5 (Minnesota)	Eagle
3	3-802.3-RM	802.3 (Minnesota)	Eagle
4	4-762.4-RM	762.4 (Minnesota)	Eagle
4	4-756.2-RM	756.2 (Minnesota)	Eagle
8	8-694.6-RM	694.6 (Minnesota)	Eagle
9	9-678.2-RM	678.2 (Minnesota)	Mussels
9	9-677.8-LW	677.8 (Wisconsin)	Eagle and Mussels
9	9-676.7-LW	676.7 (Wisconsin)	Mussels
9	9-676.0-RM	676.0 (Minnesota)	Eagle and Mussels
9	9-665.3-RI	665.3 (Iowa)	Mussels
10	10-644.2-LW	644.2 (Wisconsin)	Mussels
10	10-637.2-LW	637.2 (Wisconsin)	Mussels
10	10-637.2-RI	637.2 (Iowa)	Mussels
10	10-627.9-RI	627.9 (Iowa)	Mussels
10	10-623.0-LW	623.0 (Wisconsin)	Mussels
	*** Snagging ***		
All	Upper Mississippi, St. Croix and Minnesota Rivers	where needed	Eagle and Mussels

* Changed conditions could cause additional endangered species coordination to be required at any of the proposed dredging locations or recreational beach sites.

5.9 CONFLICTS BETWEEN ALTERNATIVES AND OBJECTIVES OF FEDERAL, REGIONAL, STATE, AND LOCAL LAND USE PLANS, POLICIES, AND CONTROLS

The CMMP recommends structural modifications and maintenance to reduce or control dredging requirements. Structural modifications and repairs could affect Federal, regional, State, and local land use plans. However, without more site-specific information, the potential impacts cannot be assessed at this time. The following sections summarize the potential impacts on land use from use of the placement sites under the CMMP.

5.9.1 Upper Mississippi River Land Use Allocation Plan

The proposed CMMP placement sites generally conform with the Upper Mississippi River Land Use Allocation Plan (LUAP) and Environmental Assessment prepared for the LUAP (USACE, 1983). The following COE owned sites do not conform to the designated land use:

Morgan's (3-802.3-RME) - Low Density Recreation
Corps Island (3-799.2-RMT) - Low Density Recreation
Island 58 (5A-743.5-LWT) - Wildlife Management
Fountain City Service Base (5A-733.5-LWP) - Wildlife Management
Indian Camp Light (9-665.8-RIE) - Low Density Recreation
McMillan Island (10-618.7-RIT) - Low Density Recreation

In the cases of Morgan's and Indian Camp Light, the use of these sites for emergency dredging should not change their designated use. Material would only be placed at these sites for emergency dredging operations, with removal of this material as soon as practicable. These areas could be reshaped during these removal operations to maintain their designated use for low density recreation. The designated use for the remaining sites would be changed from their present designation for either low density recreation (12 acres) or wildlife management (5 acres) to use for project operations.

The following USFWS owned sites do not conform to the designated land use:

Alma Marina (4-754.0-LWP) - Wildlife Management
Winter's Landing (7-708.7-LWE) - Low Density Recreation & Wildlife Mgt.
Dakota Island (7-706.5-RMT) - Low Density Recreation
Lansing Highway Bridge (9-663.5-LWP) - Wildlife Management
Jackson Island (10-644.5-RIE) - Low Density Recreation
Weaver Bottoms (5-744.0-RMP) - Low Density Recreation & Wildlife Mgt.

As with the emergency sites discussed above, emergency use of Winter's Landing and Jackson Island should not change the designated use for low density recreation. The portion of the Winter's Landing site that presently is designated for wildlife management would change to low density recreation. One of the goals for the Weaver Bottoms Rehabilitation Project is to restore fish and wildlife values. The designated use for the remaining sites would be changed from their

present designation for either low density recreation (8 acres) or wildlife management (8 acres) to use for project operations.

5.9.2 Upper Mississippi River National Wildlife and Fish Refuge (Refuge)

The Upper Mississippi National Wildlife and Fish Refuge was established by Congress in 1924. It stretches 284 miles, covering 195,000 acres, through the river corridor from Wabasha, Minnesota, to Rock Island, Illinois. The USFWS owns 75,550 acres in fee title in pools 4 through 10. In addition, the USFWS manages 41,442 acres of Corps administered land in pools 4 through 10 as part of the Upper Mississippi Refuge. While the Upper Mississippi River Wildlife and Fish Refuge Act specifically prohibits activities that adversely affect Refuge flora and fauna, further protection was included under the National Wildlife Refuge Administration Act of 1966. This latter Act requires a compatibility determination for use of refuge lands. This means that proposed uses or projects must be shown to be compatible with the major purposes for which the refuge was established, the goals of the National Wildlife Refuge System and the objectives of the Refuge. A total of 268 acres (108 acres for the Weaver Bottoms project) of USFWS lands and 177 acres of COE lands, which are generally part of the Refuge, would be used for placement of dredged material. Use of most of these Refuge lands has been approved by the COE and USFWS in the Corps Master Plan (USACE 1983) and the Final Environmental Impact Statement/Refuge Master Plan (USFWS 1987). However, as indicated in the preceding section, 20 acres of low density recreation lands and 13 acres of wildlife management lands would be converted to use for dredged material placement.

5.9.3 Minnesota Valley National Wildlife Refuge

None of the proposed dredged material placement sites located along the Minnesota River are located within the Minnesota Valley National Wildlife Refuge or would conflict with the designated use for the Refuge.

5.9.4 National Park Service (NPS)

The National Park Service (NPS) is charged with preserving and protecting the Nation's cultural and natural heritage for present and future use and enjoyment. To achieve this goal, the NPS uses five major classifications of cultural and natural resource management units: national parks, monuments, historical sites, recreation areas, and wild and scenic rivers. In the St. Paul District, NPS manages Effigy Mounds National Monument in pool 10; the lower 52 miles of the St. Croix River as a National Scenic Riverway; a 72-mile reach of the UMR, including Upper St. Anthony through pool 2, and 4 miles on the Minnesota River, from its confluence with the UMR, as a National River and Recreation Area (MNRRA); and numerous national historic areas. Since the NPS does not control much of the lands along the UMR corridor or along the lower St. Croix River, which are subject to developments inconsistent with their management objectives, the NPS relies on cooperation with other Federal, State, and local government agencies, private organizations and individuals to ensure compatible land and water uses.

Some of the goals in the Comprehensive Management Plan developed by the NPS for MNRRA are as follows: preserve, enhance, and restore natural resources; improve water quality; encourage economic development activities that take advantage of the corridor's attributes in a manner that preserves, protects, and enhances the natural and cultural resources in the corridor; and enhance opportunities for public outdoor recreation, education, and scenic enjoyment. Much of the UMR corridor in upper pool 2 and pools 1, LSAF, and USAF are owned and operated as city parks by Minneapolis and St. Paul. The cities of St. Paul and Minneapolis, as the local sponsors, have provided the placement sites within these reaches, consistent with their management objectives. The proposed dredging and use of most of the dredged material placement sites would be compatible with the MNRRA comprehensive management plan, except for the St. Paul Barge Terminal placement site in pool 2. NPS "believes that development of the St. Paul Barge Terminal Site constitutes a significant and environmental destructive modification of the river" (see Appendix F: USDOI comment 7 - pages F-5 through F-8). NPS has determined that "development of the St. Paul Barge Terminal site for dredge material disposal is inconsistent with and would not conform to the goals and policies of the MNRRA Comprehensive Management Plan."

The NPS has voiced a general concern with maintaining a 9-foot navigation channel project on the St. Croix River, without additional information and evaluation (See Appendix F: USDOI comments 2 through 6, pages F-3 through F-8). All placement sites on the St. Croix River were selected to be compatible with the NPS's goal of balancing the demand for recreational use against the objective of preserving the natural values of the area. Placement sites in the CMMP are for recreational beach development or maintenance. Snagging on the St. Croix River is done at the request of the NPS.

5.9.5 State Parks, Refuges and Management Areas

The Hwy 77 Bridge placement site (MN-7.3-RMP) is part of the Minnesota Fort Snelling State Park. The local sponsor for the Minnesota River project, the Lower Minnesota River Watershed District has worked out a long-term agreement with the Minnesota Department of Natural Resources for use of this area as a dredge material placement site.

The Kinnickinnic Bar Upper (SC-6.7-LWP) and Lower (SC-6.5-LWP) sites are State management areas. These lands are part of the Kinnickinnic State Park. The plan for placement of material at these sites was developed in concert with the Park Manager to ensure compatibility with the park management plan.

The Morgan's Coulee placement site (3-802.3-RME) is owned by the Corps of Engineers, but is managed as part of the Gores Wildlife Management Area by the Minnesota Department of Natural Resources under a license agreement. It is designated for low density recreational use (see section 5.9.1 Upper Mississippi River Land Use Allocation for further discussion on land use compatibility).

The Dakota Boat Ramp placement site (7-707.3-RMP) is owned by the Minnesota Department of Natural Resources Trails and Waterways Unit. The site was originally acquired for the construction of a boat ramp and parking lot on two acres of the site, using dredge material as fill. The remaining three acres would be used under the CMMP as a beneficial use stockpile site.

5.9.6 Local and Regional Plans

As of the publication of this final EIS, it is believed the proposed CMMP is not in conflict with any local or regional land use plans. A total of 602 acres of non-Federal land will be required to implement the CMMP. In implementing the CMMP for those sites in non-Federal ownership, first priority will be given to reaching a long-term permit or lease agreement with the owners. Presently under the CMMP, approximately 199 acres have been or will be acquired to implement the CMMP. Local sponsors are responsible for providing approximately 44 acres. For the remaining 359 acres needed to implement the CMMP, long-term permit or lease agreements with State, local, and private owners will be pursued. When this is not possible for a given site, acquisition will be pursued.

6.0 PUBLIC INVOLVEMENT AND COORDINATION

6.1 SCOPING

Community and public agency involvement was an integral part of the development and assessment of alternatives pertaining to COE maintenance of the 9-Foot Navigation Channel project (see Section 2.1). This involvement started in earnest with the interagency and public, GREAT I study (GREAT I 1980). Starting in the 1980's, the District prepared a GREAT I Implementation Report and conducted a series of reconnaiassance studies evaluating the GREAT I channel maintenance plan and other alternatives for various study reaches. These efforts were intensively coordinated with appropriate Federal and State agencies, mainly through the River Resources Forum (RRF).

A Notice of Intent to prepare an environmental impact statement was published in the Federal Register on March 11, 1991. On March 14, 1991, an initial scoping letter was sent to Federal, State, and local agencies and the public.

A presentation was given at the April 16, 1991, meeting of the RRF to brief member agencies and others on the purpose, proposed scope, and proposed schedule for the EIS.

Twelve responses to the initial scoping letter were received from various governmental agencies and private organizations. On May 16, 1991, the proposed alternative dredged material placement sites and plans to be addressed in the EIS were distributed to involved Federal and State management agencies.

From May 1991 to approximately 1995, the CMMP was refined and coordinated through the River Resources Forum (Comments received from the agencies on the CMMP and District responses are contained in Appendix E). In addition, Table 5-13 indicates the status of applicable State certifications and permits for the placement sites in the CMMP.

In October 1995, a series of three public meetings to solicit public input and present the CMMP were held at Prescott, Wisconsin, at Winona, Minnesota, and at Lansing, Iowa (Comments received from the public on the CMMP and District responses are contained in Appendix E).

In April 1996, the draft CMMP was distributed to the RRF for formal comment. In November 1996, a draft EIS assessing the impacts of the CMMP was released for public review. Comments on the draft EIS were received from a number of private, local, State and Federal interests (see Appendix F of final EIS).

6.2 REQUIRED COORDINATION

6.2.1 Fish and Wildlife Coordination

Throughout the scoping and preparation of the draft and final EISs, coordination was maintained with the U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency - Region V, U.S. Coast Guard, Minnesota-Wisconsin Boundary Area Commission, the State Departments of Natural Resources of Iowa, Minnesota, and Wisconsin, and the Minnesota Pollution Control Agency. These agencies were all members of the GREAT I study and have been active during the planning and implementation of the GREAT I recommendations.

6.2.2 Cultural Resource Coordination

Many of the placement sites presented in this final EIS have been coordinated with the State Historic Preservation Offices of Wisconsin, Minnesota and Iowa, as appropriate, and with the National Park Service and the pertinent State Archeologist. This final EIS will serve as coordination for those sites that we have not yet coordinated or for which we have only partial coordination.

6.2.3 Environmental Impact Statement Review

This final EIS has been sent to the agencies, organizations and individuals listed in Section 7.0 for official review. Additionally, notices of availability of the final EIS have been sent to other interested parties informing them of whom to contact to receive a copy of the final EIS. Comments received on the draft EIS have been addressed and included in the final EIS (see Appendix F).

The CMMP is available for review by request. Copies of the CMMP have been sent to local, State and Federal agencies and libraries throughout the St. Paul District. The CMMP is available for review at these locations. An executive summary of the CMMP including a distribution list (see Attachment 2 of Appendix A) is provided as Appendix A.

7.0 LIST OF AGENCIES, ORGANIZATIONS AND PERSONS TO WHOM COPIES OF THE EIS WERE SENT

CONGRESSIONAL

Senator Russell Feingold (WI)
Senator Herbert Kohl (WI)
Senator Rod Grams (MN)
Senator Paul Wellstone (MN)
Senator Thomas Harkin (IA)
Senator Charles Grassley (IA)
Honorable Ron Kind (WI)
Honorable David Obey (WI)
Honorable Thomas E. Petri (WI)
Honorable Martin Olav Sabo (MN)
Honorable Bill Luther (MN)
Honorable Gil Gutknecht (MN)
Honorable Jim Ramstad (MN)
Honorable Bruce Vento (MN)
Honorable Tom Latham (IA)
Honorable James Nussle (IA)

FEDERAL

United States Environmental Protection Agency (EPA) - Washington, DC [*5 copies*]
EPA, Region V - Chicago, IL
EPA, Region VII - Kansas City, KS
United States Department of the Interior (DOI) - Washington, DC [*18 copies*]
DOI, Fish and Wildlife Service, Twin Cities Field Office - Bloomington, MN
DOI, National Park Service, Mississippi National River and Recreation Area - St. Paul, MN
DOI, National Park Service, St. Croix National Scenic Riverway - St. Croix Falls, WI
DOI, Bureau of Indian Affairs - Minneapolis, MN
Prairie Island Indian Reservation - Welch, MN
United States Department of Agriculture (USDA), Forest Service - Milwaukee, WI
USDA, Natural Resource Conservation Service - Madison, WI
USDA, Natural Resource Conservation Service - St. Paul, MN
United States Federal Highway Administration - Olympia Fields, IL
United States Coast Guard (USCG) - Keokuk, IA
USCG - St. Paul, MN
USCG - St. Louis, MO
Advisory Council on Historic Preservation - Washington, DC
Federal Emergency Management Administration - Chicago, IL
United States Department of Health and Human Services - Chicago, IL

INTERSTATE

Minnesota-Wisconsin Boundary Area Commission
Upper Mississippi River Basin Association
Upper Mississippi River Conservation Commission

IOWA

Iowa Department of Transportation - Ames, IA
Iowa Department of Natural Resources - Des Moines, IA
Iowa Department of Natural Resources - Bellvue, IA
Iowa State Historic Preservation Office - Des Moines, IA
Iowa State Archaeologist - Iowa City, IA
City of Guttenberg
City of Lansing
City of Marquette
City of New Albin
Village of McGregor
Allamakee County
Clayton County
Lansing Public Library
Guttenberg Public Library

WISCONSIN

Wisconsin Department of Transportation - Madison, WI
Wisconsin Department of Natural Resources - LaCrosse, WI [*3 copies*]
Wisconsin State Historic Preservation Office - Madison, WI
Wisconsin State Archaeologist - Madison, WI
City of Alma
City of Buffalo City
City of Hudson
City of Prairie du Chien
City of Prescott
City of La Crosse
City of Onalaska
Village of Ferryville
Village of Fountain City
Village of Genoa
Village of Stoddard
Town of Bloomington
Town of Trempealeau
Grant County

Crawford County
Pierce County Highway Department
La Crosse County Highway Department
Buffalo County Highway Department
Vernon County
Trempealeau County Highway Department
St. Croix County
Pepin County
Prairie du Chien Library
LaCrosse Public Library
Trempealeau Public Library
Alma Public Library
Pepin Public Library
Prescott Public Library
Hudson Public Library

MINNESOTA

Minnesota Department of Transportation - St. Paul, MN
Minnesota Department of Natural Resources - St. Paul, MN [*12 copies*]
Minnesota Pollution Control Agency - St. Paul, MN
Minnesota State Historic Preservation Office - St. Paul, MN
Minnesota State Archaeologist - St. Paul, MN
Metropolitan Council
Minneapolis Parks and Recreation Board
Board of Water and Soil Resources
Winona Port Authority
St. Paul Port Authority
City of Cottage Grove
City of Hastings
City of Red Wing
City of South St. Paul
City of St. Paul
City of Minneapolis
City of Brownsville
City of Dakota
City of Kellogg
City of La Crescent
City of Wabasha
City of Winona
City of Savage
City of Burnsville
City of Bloomington

Village of Minnesota City
Wabasha County
Dakota County Engineer
Goodhue County Highway Department
Washington County Parks
Houston County
Winona County
Wabasha Public Library
Winona Public Library
Red Wing Public Library
Lake City Public Library
Cottage Grove Public Library
Hastings Public Library
Minneapolis Public Central Library
St. Paul Public Central Library

PRIVATE

National Wildlife Federation - Washington, DC
Environmental Defense Fund - Washington, DC
Upper Mississippi Waterways Association - St. Paul, MN
Ducks Unlimited - Minnetonka, MN
Izaak Walton League - Elm Grove, WI
Izaak Walton League - Edina, MN
Sierra Club - Minneapolis, MN
Sierra Club - Madison, WI
National Audubon Society - St. Paul, MN

8.0 LIST OF PREPARERS

Mr. Dennis Anderson (Biologist/Fisheries)

Experience - Masters degree in Aquatic Biology; 18 years experience in environmental impact assessment and documentation.

Role - EIS coordinator; assessment of effects on water quality, fish and wildlife resources and endangered species.

Dr. John Anfinson (Historian)

Experience - Doctor of Philosophy in History; 15 years experience in cultural resources management.

Role - Assessment of effects on historical and archeological resources.

Mr. David Berwick (Archeologist)

Experience - Masters degree in Archeology; 19 years experience in cultural resources management and impact assessment.

Role - Assessment of effects on archeological resources.

Mr. Peter Fasbender (Biologist/Wildlife)

Experience - Masters degree in Wildlife Biology; 8 years experience in environmental impact assessment and documentation.

Role - Assessment of effects on water quality, fish and wildlife resources and endangered species.

Mr. Dan Krumholz (Chief, Waterways Section - Mississippi River Project Office)

Experience - Bachelors degree in Biology; 24 years experience in channel maintenance.

Role - Preparation of CMMP; public and agency coordination.

Dr. Gary Nelson (Sociologist)

Experience - Doctor of Philosophy in Sociology; 13 years experience in social analysis and impact assessment.

Role - Assessment of effects on socioeconomic resources.

Mr. Steve Tapp (Channel Maintenance Coordinator)

Experience - Bachelors degree in Resource Management; 7 years experience in channel maintenance planning.

Role - Preparation of CMMP; public and agency coordination.

Mr. Tim Yager (Biologist/Fisheries)

Experience - Masters degree in Water Resources; 5 years experience in environmental impact assessment and documentation.

Role - Assessment of effects on water quality, fish and wildlife resources and endangered species.

9.0 REFERENCES

Alabaster, J.S. 1985. Habitat Modification and Freshwater Fisheries. Proceedings of a Symposium of the European Inland Fisheries Advisory Commission. Butterworths, Great Britain.

Anderson, D., T. Birkenstock, J.S. Hendrickson, and T. Sardinas. 1993. Weaver Bottoms Rehabilitation Project Resource Analysis Program: Interim Report, 1985-1991.

Anderson, D.A., D.B. Wilcox. and D.R. McConville. 1983. Physical and biological investigations of the main channel border habitat of Pool 5A on the Upper Mississippi River in 1980. St. Paul District, Corps of Engineers.

Anderson, D.D, R.J. Whiting, and B. Jackson. 1981. An assessment of water quality impacts of maintenance dredging on the Upper Mississippi River in 1978. U.S. Army Corps of Engineers, St. Paul District.

Anderson, D.D, R.J. Whiting, and J. Nosek. 1981. An assessment of water quality impacts of maintenance dredging on the Upper Mississippi River in 1979. U.S. Army Corps of Engineers, St. Paul District.

Anfinson, John O. 1993. Commerce and Conservation on the Upper Mississippi River. Pages 385-417 in: The Annals of Iowa 52:4.

Bell, F.T. 1936. Proposals for a solution of the fishery conservation problem. The Progressive Fish Culturalist, Bureau of Fisheries, U.S. Department of Commerce.

Bhowmik, N.G., J.R. Adams, and R.E. Sparks. 1986. Fate of navigation pool on Mississippi River. Journ. of Hyd. Eng., Vol. 112, No. 10. pp. 967-970.

Blair, W.A. 1930. A raft pilot's log: A history of the great rafting industry on the Upper Mississippi, 1840-1915. Arthur H. Clark Company, Cleveland.

Blom, B.E., T.F. Jenkins, D.C. Leggett, and R.P. Murrmann. 1976. Effect of sedimentary organic matter on migration of various chemical constituents during disposal of dredged material. U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire. Prepared for Office, Chief of Engineers, U.S. Army, Washington, D.C. Contract Report D-76-7. 183 pp.

Boszhardt, R. and J. Theler. *undated.* Historic Properties Management Plan (HPMP), Section 5, October 1996 draft. St. Paul District, U.S. Army Corps of Engineers.

Brunet, P.J. 1977. The Corps of Engineers and navigation improvement on the channel of the Upper Mississippi River to 1939. Master's thesis, University of Texas, Austin.

Burch, C.W., P.R. Abel, M.A. Stevens, R. Dolan, B. Dawson, and F.D. Shields Jr. 1984. Environmental Guidelines for Dike Fields. Technical Report E84-4. prepared by Versar Inc. Springfield, Virginia, and the Environmental Laboratory, Waterways Experiment Station, Vicksburg, Mississippi.

Bureau of the Census. 1990. Census of Population and Housing.

Bureau of the Census. 1980. Census of Population and Housing.

Bureau of the Census. 1992a. Censuses of Wholesale Trade, Retail Trade and Service Industries.

Bureau of the Census. 1992b. Census of Agriculture.

Bureau of Labor Statistics. 1994. Employment in State and Local Areas.

Burky, A.J. 1983. Physiological ecology of freshwater bivalves. *in*: The Mollusca, vol. 6, Ecology. K.M. Wilbur, ed. Academic Press, New York.

Chen, K.Y., S.K. Gupta, A.Z. Sycip, J.C.S. Lu, M. Knezevic, and W.W. Choi. 1976. Research study on the effect of dispersion, settling and resedimentation on migration of chemical constituents during open water disposal of dredged materials. University of Southern California, Environmental Engineering Program, Los Angeles. Prepared for U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. Contract Report D-76-1. 243 pp.

Chen, Y.H. and D.B. Simons. 1979. Geomorphic study of Upper Mississippi River. Journal of The Waterway, Port, Coastal and Ocean Division, Proceedings of the American Society of Civil Engineers. Vol. 105, No. WW3.

Church, P.E. 1984. The archeological potential of pool 10, Upper Mississippi River: A geomorphological perspective. Prepared for the U.S. Army Corps of Engineers, St. Paul District. 59 pp + appendix and plates.

Church, P.E. 1985. The archeological potential of pool 10, Upper Mississippi River: A geomorphological perspective. The Wisconsin Archeologist 66(3):197-242.

Colingsworth, R.F., B.J.R. Gudmundson, W.L.K. Schwarz and C.W. Rudelius. 1973a. Final report: Environmental Impact Assessment Study of the Northern Section of the Upper Mississippi River, Minnesota River Pool. for: St. Paul District Corps of Engineers. Environmental Systems Division, North Star Research Institute, Minneapolis, MN.

Colingsworth, R.F., B.J.R. Gudmundson, W.L.K. Schwarz and C.W. Rudelius. 1973b. Final report: Environmental Impact Assessment Study of the Northern Section of the Upper Mississippi River, St. Croix River Pool. for: St. Paul District Corps of Engineers. Environmental Systems Division, North Star Research Institute, Minneapolis, MN.

Dobbs, C.A. and H. Mooers. 1991. A phase I archeological and geomorphological study of Lake Pepin and the upper reaches of navigation pool 4, Upper Mississippi River (Pierce and Pepin counties, Wisconsin; Goodhue and Wabasha Counties, Minnesota). Institute for Minnesota Archeology Reports of Investigations Number 44, Minneapolis, MN. Prepared for the U.S. Army Corps of Engineers, St. Paul District. 184 pp + plates.

Dodd, D.B. and W.S. Dodd. 1973. Historical Statistics of the United States, 1790-1970, Vol. II - The Midwest. University of Alabama Press.

Dixon, F.H. 1909. A traffic history of the Mississippi River system. National Waterways Commission, document no. 11. U.S. Government Printing Office, Washington.

Duncan, R.E., and P.A. Thiel. 1983. A survey of the mussel densities in pool 10 of the Upper Mississippi River. WI Dept. Nat. Resour. Tech. Bull. No. 139. 14 pp.

Eckblad, J.W., N.L. Peterson, K. Ostlie and A. Temte. 1977. The morphometry, benthos and sedimentation rates of a floodplain lake in Pool 9 of the Upper Mississippi River. The American Midland Naturalist, Vol. 97, No. 2, pp. 433-443.

Fremling, C.R., D.N. Nielsen, D.R. McConville, and R.N. Vose. 1976. The Weaver Bottoms: A field model for the rehabilitation of backwater areas of the Upper Mississippi River by modification of standard channel maintenance practices. GREAT I study of the Upper Mississippi River (1980).

Freshwater Foundation and McKnight Foundation. 1995. The Mississippi River in the Upper Midwest: The State of Its Environment and Economy.

Fries, R.F. 1951. Empire in pine: The story of lumbering in Wisconsin, 1830-1900. State Historical Society of Wisconsin, Madison.

Fuller, S.L.H. 1980. Freshwater mussels (Mollusca: Bivalvia: Unionidae) of the Upper Mississippi River: observations at selected sites within the 9-foot navigation channel project for the St. Paul District, United States Army Corps of Engineers, 1977-1979. Academy of Natural Sciences of Philadelphia.

Fuller, S.L.H. 1978. Freshwater mussels (Mollusca: Bivalvia: Unionidae) of the Upper Mississippi River: observations at selected sites within the 9-foot navigation channel project on behalf of the United States Army Corps of Engineers, No 78-33. Academy of Natural Sciences of Philadelphia.

Fuller, S.L.H. 1974. Clams and mussels (Mollusca: Bivalvia). Pages 215-273 *in* C.W. Hart, Jr. and S.L.H. Fuller, eds. Pollution ecology of freshwater invertebrates. Academic Press, New York.

Great Lakes Archaelogical Research Center (GLARC). 1996. Cultural Resources Inventory of the Upper Mississippi River, St. Anthony Falls to Pool 10, Wisconsin, Iowa, and Minnesota. Reports of Investigation No. 384. Prepared for the U.S. Army Corps of Engineers, St. Paul District. 376 pp.

Great River Environmental Action Team (GREAT) - Water Quality Work Group. 1978a. A pilot study on effects of hydraulic dredging and disposal on water quality of the Upper Mississippi River (July 1976).

Great River Environmental Action Team (GREAT) - Water Quality Work Group. 1978b. Effects of clamshell (mechanical) dredging and disposal on water quality of the Upper Mississippi River.

Great River Environmental Action Team (GREAT). 1980a. Great River Environmental Action Team I Study of the Upper Mississippi River, Guttenberg, Iowa, to the Head of Navigation at Minneapolis, Minnesota (9 volumes).

Great River Environmental Action Team (GREAT). 1980b. Final Environmental Impact Statement: Great River Environmental Action Team I Study of the Upper Mississippi River, Guttenberg, Iowa, to the Head of Navigation at Minneapolis, Minnesota (Volume 9).

Haites, E.F., J. Mak and G.M. Walton. 1975. Western river transportation: the era of early internal development, 1810-1860. The Johns Hopkins University Press, Baltimore.

Hartsough, M. 1934. From canoe to steel barge. University of Minnesota Press, Minneapolis.

Havlik, M.E. 1980. The historic and present distribution of the endangered naiad mollusk *Lampsilis higginsi* (Lea 1857). Am. Malacological Union Bull., pp. 19-22.

Heath, D. and P. Rasmussen. 1990. Results of base-line sampling of freshwater mussel communities for long-term monitoring of the St. Croix National Scenic Riverway, Minnesota and Wisconsin. Wisconsin Department of Natural Resources.

Hesse, L.W., C.B. Stalnaker, N.G. Benson, and J.R. Zuboy (editors). 1993. Restoration Planning for the Rivers of the Mississippi River Ecosystem. U.S. Department of Interior, National Biological Survey. 502 pp.

Iowa Department of Employment Services. 1994. Employment data.

Izaak Walton League of America and Natural Resoucres Defense Council. 1994. Restoring the Big River: A Clean Water Act Blueprint for the Mississippi River. Prepared by A. Robinson and R. Marks.

James, W.F. and J.W. Barko. 1995. Wind-induced sediment resuspension and export in Marsh Lake, Western Minnesota. U.S. Army Corps of Enginneers, Waterways Experiment Station. Technical Report W-95-1.

James, W.F. and J.W. Barko. 1990. Macrophyte influences on the zonation of sediment accretion and composition in a north-temperate reservoir. Arch. Hydrobiol. 120:2. pages 129-142.

Jefferson, A. 1995. Changes in island morphology and sediment distribution in lower Pool 6, Mississippi River (unpublished). 8 pp. + app.

Korschgen, C.E., G.A. Jackson, L.F. Muessig, and D.C. Southworth. 1987. Sedimentation in Lake Onalaska, Navigation Pool 7, Upper Mississippi River, since impoundment. Water Res. Bull., Am. Water Res. Assoc. Vol. 23, No. 2. pp. 221-226.

Lee, G.F., M.D. Pivoni, J.M. Lopez, G.M. Mariani, J.S. Richardson, D.H. Homer, and F. Saleh. 1975. Research study for the development of dredged material disposal criteria. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. 337+ pp.

Lubinski, K., J. Wiener, and N. Bhowmik (editors). 1995. Papers Presented at International Conference: Sustaining the Ecological Integrity of Large Floodplain Rivers. Published by Wiley in Regulated Rivers - Research and Management. Volume 11, Numbers 1-4.

Marking, L.L., V.K. Dawson, J.L. Allen, T.D. Bills, and J.J. Rach. 1981. Biological activity and chemical characteristics of dredge material from ten sites on the Upper Mississippi River. Summary report. U.S. Fish and Wildlife Service, La Crosse, Wisconsin. 145 pp.

McHenry, J.R. and J.C. Ritchie. 1975. Sedimentation of fines in the pools and backwater lakes of Lock and Dam No. 4 through No. 10 on the Upper Mississippi River. Final Report for 1975.

Merritt, R.H. 1980. The development of the lock and dam system on the Upper Mississippi River. National Waterways Roundtable Papers, Proceedings: History, Regional Development, Technology, A Look Ahead. U.S. Government Printing Office, Washington.

Meade, R.H.(editor). 1995. Contaminants in the Mississippi River, 1987-92. U.S. Geological Survey - Circular 1133. U.S. Printing Office. 140 pp.

Miller, A.C. and B.S. Payne. 1992. A summary of studies on freshwater molluscs in the East Channel of the Upper Mississippi River conducted by the U.S. Army Engineer Waterways Experiment Station, 1984-1990. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi 39180.

Minnesota Department of Economic Security. 1994. Employment data.

Minnesota Department of Planning. *undated.* Census information.

Minnesota Pollution Control Agency. 1992. Minnesota water quality: Water years 1990-91. The 1992 Report to the Congress of the United States. St. Paul, Minnesota.

Mississippi River Corridor Commission. 1995. Draft Mississippi River Corridor Study (2 volumes).

Nanda, S.K. and R.M. Baker. 1983. Experience in channel maintenance in the Upper Mississippi River. Proceedings of the Conference Rivers '83.

National Planning Data Corporation. 1989. Population, Housing and Wealth (1969, 1979 and 1994p data), 1989 update.

Olson, K.N. and M.P. Meyer. 1976. Vegetation, land and water surface changes in the upper navigable portion of the Mississippi River basin over the period 1929-1973. Institute of Agriculture, Forestry and Home Economics Research Report No. 76-4, College of Forestry and the Agricultural Experiment Station, University of Minnesota, St. Paul.

O'mack, S. and B. Withrow. 1989. Report of Investigations No. CENCS-PD-ER-35. St. Paul District, USACE.

Overstreet, D. 1982. Cultural resources literature search and records review - Upper Mississippi River. Reports of Investigation no. 116, Great Lakes Archaeological Research Center, Milwaukee, WI.

Overstreet, D., J.D. Richards and A. Jalbert. 1996. Cultural Resources Inventory of the Upper Mississippi River, St. Anthony Falls to Pool 10, Wisconsin, Iowa, and Minnesota.

Peddicord, R., H. Tatem, A. Gibson, and S. Pedron. 1980. Biological assessment of Upper Mississippi River sediments. U.S. Army Engineer Waterways Experiment Station, Environmental Laboratory, Vicksburg, Mississippi. Prepared for U.S. Army Corps of Engineers, St. Paul District, and Office, Chief of Engineers, Washington, D.C. Misc. Pap. EL-80-5. 87 pp.

Peterson, W.J. 1930. Captains and cargoes of early Upper Mississippi steamboats. Wisconsin Magazine of History 13:224-240.

Rasmussen, J.L. 1983. A summary of Known Navigation Effects and a Priority List of Data Gaps for the Biological Effects of Navigation on the Upper Mississippi River. Prepared for U.S. Army Corps of Engineers, Rock Island District. 96 pp.

Roberts, N and C. Dobbs. 1993. "A Lower Minnesota River Valley Cultural Resource Study and Interpretive Plan for the Minnesota Valley State Park & Trail." Prepared for the Minnesota Department of Natural Resources.

Rogalla, J.T. and P.J. Boma. 1996. Rates of sedimentation along selected backwater transects in Pools 4, 8, and 13 of the Upper Mississippi River. U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, October 1996. LTRMP 96-T005. 24 pp.

Rose, W.J. 1990. Sediment Load and Particle Sizes in Lower Reaches of the Chippewa, Black, and Wisconsin Rivers in Western Wisconsin. U.S. Geological Survey, Water Resources Investigation Report 90-4124.

Scarpino, Philip V. 1985. Great River: An Environmental History of the Upper Mississippi, 1890 - 1950. Columbia: University of Missouri Press.

Scientific Assessment Strategy Team (SAST). 1994. Science for Floodplain Management into the 21st Century - A Blueprint for Change - Part V. Report to the Administration Floodplain Management Task Force. 272 pp.

Shaw, S.P., and C.G. Fredine. 1956. Wetlands of the United States. U.S. Fish and Wildlife Serv., Circ. 39. 67 pp.

Simons, D.B., S.A. Schumm, Y.H. Chen, and R.M. Beathard. 1976. A geomorphological study of pool 4 and tributaries of the Upper Mississippi River. Colorado State University, Civil Engineering Department report. Prepared for U.S. Dept. of Interior, Fish and Wildlife Service, Twin Cities, MN.

Simons, D.B., R.M. Li, Y.H. Chen, S.S. Ellis and T.P. Chang. 1981. Investigation of Effects of Navigation Development and Maintenance Activities on Hydrologic, Hydraulic, and Geomorphic Characteristics; Working Paper 1 for Task D. Report for Env. Work Team, Upper Mississippi Basin Commission Master Plan, 76pp + Appendices.

State Library of Iowa. *undated.* Census information.

Stern, E., W. Emanuel, H.F. Krosch, J. Mick, D. Nelson, D. Roosa, M. Vanderford, and R.J. Whiting. 1982. Higgins' eye mussel recovery plan. U.S. Fish Wildl. Rep. 98 pp.

Sternberg, R.B. 1971. Upper Mississippi River Habitat Classification Survey, Hastings, Minnesota, to Alton, Illinois. Upper Miss. River Conserv. Comm., Fish Tech. Section.

Sullivan, J. and D.D. Anderson. *in press.*

Thiel, P.A. 1981. A survey of unionid mussels in the Upper Mississippi River (Pools 3-11). WI Dept. of Nat. Res. Tech. Bull. No. 124. 24 pp.

Tweet, R. 1983. History of transportation on the Upper Mississippi and Illinois Rivers. U.S. Government Printing Office, Washington.

Tweet, R. 1984. A history of the Rock Island District, U.S. Army Corps of Engineers, 1866 1983: U.S. Army District, Rock Island, IL, 441 pp.

U.S. Army Corps of Engineers (USACE). 1995a. Environmental Resource Inventory for the Upper Mississippi River, Lower Missouri River and Major Tributaries. Report prepared by Burns & McDonnell under contract with the St. Paul District, USACE.

U.S. Army Corps of Engineers (USACE). 1995b. Floodplain Management Assessment of the Upper Mississippi River and Lower Missouri Rivers and Tributaries.

U.S. Army Corps of Engineers (USACE). 1994. Upper Mississippi River - Illinois Waterway System Navigation Study - Baseline Initial Project Management Plan.

U.S. Army Corps of Engineers (USACE). 1993a. Mississippi River Operational Management Plan. St. Paul District, USACE.

U.S. Army Corps of Engineers (USACE). 1993b. Economic Impacts of Recreation on the Upper Mississippi River: Recreation Use and Activities Report. Waterways Experiment Station, Vicksburg, MS.

U.S. Army Corps of Engineers (USACE). 1987. Environmental Assessment and Finding of No Significant Impacts for Major Rehabilitation of Locks and Dams 2 through 10, Upper Mississippi River.

U.S. Army Corps of Engineers (USACE). 1983. Upper Mississippi River Land Use Allocation Plan - Master Plan for Public Use Development and Resource Management, Part I and II.

U.S. Army Corps of Engineers (USACE). 1974. Final Environmental Impact Statement: Operation and maintenance, 9-foot Navigation Channel, Upper Mississippi River, Head of Navigation to Guttenberg, Iowa. St. Paul District, USACE.

U.S. Army Corps of Engineers (USACE). 1876-1990. Annual reports of the Chief of Engineers. U.S. Government Printing Office, Washington.

U.S. Army Corps of Engineers (USACE)/Wisconsin Department of Natural Resources (WIDNR). 1993. Draft environmental impact statement: long-term channel maintenance plan for the Federal harbor and a permit application to construct and expand barge terminal facilities in the East Channel of the Upper Mississippi River at Prairie du Chien, Wisconsin. U.S. Army Engineer District, St. Paul. 118 pp. + Appendices.

U.S. Army Corps of Engineers (USACE)/Wisconsin Department of Natural Resources (WIDNR). 1996. Final environmental impact statement: long-term channel maintenance plan for the Federal harbor and a permit application to construct and expand barge terminal facilities in the East Channel of the Upper Mississippi River at Prairie du Chien, Wisconsin. U.S. Army Engineer District, St. Paul.

U.S. Army Corps of Engineers (USACE)/U.S. Fish and Wildlife Service (USFWS). 1986. Design Analysis Report and Final Supplemental Environmental Impact Statement/Weaver Bottoms Rehabilitation Plan on the Upper Mississippi River. 102 pp. + Exhibits.

U.S. Fish and Wildlife Service (USFWS). 1987. Final Environmental Impact Statement/Master Plan, Upper Mississippi River National Wildlife and Fish Refuge. North Central Region, Twin Cities, Minnesota.

Upper Mississippi River Conservation Committee (UMRCC). 1993. Facing the Threat: An Ecosytem Management Strategy for the Upper Mississippi River: A Call for Action. Rock Island, IL.

U.S. Congress, House. 1907. Mississippi River between Missouri River and St. Paul, Minnesota. 59th Congress, 2nd session, House Document No. 341.

Vaughn, P.W., D.J. Heath, P.J. Burke, B. Eliason, L.D. Everhart, D.J. Hornbach and A.R. Weisbrod. 1993. Winged Mapleleaf Mussel (*Quadrula fragosa*), Draft Recovery Plan. U.S. Fish and Wildlife Service, Region 3, Twin Cities, Minnesota.

Water Level Management Task Force/River Resources Forum. 1996. Problem Appraisal Report for Water Level Management, Upper Mississippi River.

Wisconsin Department of Administration (Demographic Service Center). *undated.* Census information.

Wisconsin Department of Labor, Industry and Human Relations. 1994. Employment data.

10.0 INDEX

Key words presented in this index are referenced to EIS section or Appendix number where additional descriptive information on the topic or subject can be found.

APPENDIX A

CHANNEL MAINTENANCE MANAGEMENT PLAN - EXECUTIVE SUMMARY
Upper Mississippi River System
Corps of Engineers, St. Paul District

Table of Contents

List of Tables

CHANNEL MAINTENANCE MANAGEMENT PLAN - EXECUTIVE SUMMARY
Upper Mississippi River
Corps of Engineers, St. Paul District

INTRODUCTION

The Channel Maintenance Management Plan (CMMP) is a comprehensive long-term plan for channel and harbor maintenance related activities on various navigation projects in the Corps of Engineers St. Paul District. It identifies designated dredged material placement sites, describes a strategy for placement site planning, discusses alternative channel maintenance techniques, and documents policies and procedures. While long-term in nature, the plan is designed to accommodate new information and changes.

HISTORICAL PERSPECTIVE

The first navigation improvement and maintenance on the Upper Mississippi River (UMR) was legislated by Congress in 1824 when the Corps was authorized to remove snags and sandbars and confine flows to the main channel. Congressional acts in 1878 and 1907 authorized construction of a 4½-foot and 6-foot channel, respectively. These were maintained with the help of wingdams, closing dams, and limited dredging. The Rivers and Harbors Act of 1930 authorized the existing 9-foot channel project which was implemented by constructing a series of locks and dams. However, it was recognized that, even with the navigation dams, supplemental dredging would be necessary, so the construction of two modern dredges including the Dredge WILLIAM A. THOMPSON was authorized. Initially after the lock and dam system was created, dredging volumes were heavy with nearly 5 million cubic yards (CY) in 1938 and declining to an average of 1.5 million annually from 1956 to 1972.

Prior to the mid-1970's the reach capability of dredging equipment was limited and dredged material was placed conveniently near the dredge cut. This had recognized environmental impacts and natural resource agencies stressed a need for changing channel maintenance practices. In 1974 an Environmental Impact Statement prepared for operation and maintenance of the navigation project concluded that enhancing dredge equipment capability was needed to improve placement site selection. It was also in 1974, that a State and Federal agency team was organized to identify and study problems associated with the river, and in particular, channel maintenance practices. This effort developed into the Great River Environmental Action Team study or GREAT I which was formally authorized by Congress in 1976. The interagency team published a nine volume report in 1980, which included a placement plan for all dredged material anticipated until the year 2025 and various other recommendations. From this study many of the 80 recommendations directed at the Corps were subsequently implemented through incorporation into the operation and maintenance program of the project. A 1992 Implementation Status and Future Program Report summarized achievements related to the GREAT I recommendations and noted the development of the CMMP as the Action Item I, Future Program.

DREDGED MATERIAL MANAGEMENT

A basic objective of the District's dredged material placement site planning is to select environmentally acceptable sites where beneficial use of the material is possible. During the planning process the District reviewed the GREAT recommended sites and compared them to alternative sites to determine whether use was justified from economic, social, and environmental perspectives and to assure consistency with Federal laws and regulations. The planning process begins with the projection of dredging volumes and beneficial use quantities to determine the area required for a forty-year period. The identification of reasonable alternative placement sites is followed by evaluation and selection. Proposed plans are coordinated with other agencies through the River Resources Forum (RRF). Plans are also coordinated with the public through public meetings.

The CMMP is a composite of GREAT I study recommendations, Corps planning since GREAT, and subsequent changes and modifications. As new plans are developed and coordinated, they will be incorporated into the CMMP. Site specific information sheets and operational maps of placement areas are contained in Part III of the CMMP. Part III also includes a five-year placement action plan that will be updated annually. Through the District's dredged material placement planning and active management practices, the anticipated acres of land needed for this plan have been reduced by approximately 23 percent from the GREAT I study recommendations and anticipated wetland impacts have been reduced by approximately 55 percent.

The Corps prefers to place material at permanent, Federally owned sites which will be managed to extend their longevity by minimizing dredging quantities and promoting beneficial use. Site preparation and care will vary depending on the need to protect the site for aesthetic or social concerns or to prevent erosion. Non-Federally owned sites are used through real estate arrangements with the landowners. In some cases, it is necessary to place dredged material at a temporary site because it is more efficient to do so or because of emergency channel conditions.

The District has provided dredged material for various beneficial uses to other agencies, local communities, and private individuals at no cost. In the 10-year period from 1985 through 1994, 80 percent of all material dredged has been placed at beneficial use locations. The dredged material is primarily medium grain sand that is used as an aggregate in construction products, for winter road ice control, landfill for development, fill for construction projects, environmental enhancement projects, recreational beach maintenance and many other uses. Because these opportunities are sometimes unpredictable, it is necessary to retain flexibility in the placement site selection and approval process. Recreational beaches on islands have long been popular with boaters and the District encourages using dredged material to enhance appropriate beaches. Interagency groups have developed beach plans and will continue to work together on implementing these plans.

CHANNEL MANAGEMENT

It is the District's objective to optimize the balance between dredging frequency, quantity and cost without compromising safety and reliability. To avoid frequent re-dredging and ensure the least overall cost of maintaining the project, advance maintenance dredging to a specified depth and/or width is practiced. To assure a 9-foot channel is available, dredging is initiated when shoaling results in depths less than 10.5 feet. Dredging is then accomplished to a depth between 11 and 13 feet below low control pool elevation. Authorized depths and widths plus some of the factors and criteria that determine them are explained in Part III of the CMMP.

The Mississippi River is a complex and dynamic system for sediment movement. As data collection and evaluation capability improve, the magnitude of these changes is becoming more quantifiable. Some major factors which influence shoaling in the navigation channel are hydrologic events and related flow conditions, river geomorphology, and channel control structures.

Part III of the CMMP contains a summary of all dredging since 1970. The District has been very successful in reducing dredging quantities through active management practices. Since 1975, yearly dredging quantities have averaged about 690,000 CY down from 1.5 million CY for the years 1952 to 1974. The twenty-mile reach below the mouth of the Chippewa River accounts for about 45 percent of the District's dredged material. While bank protection on the Chippewa has been studied, experts have concluded that it would not be economically feasible and would not substantially reduce sediment load.

Channel control structures, like wingdams, still perform a valuable role. Rehabilitating, restructuring, or supplementing these features can help reduce dredging requirements. The District identifies problem reaches that might be improved through structural measures and evaluates alternatives with other agencies and local organizations.

Adjusting channel dimensions, accurate channel marking, and information sharing are a few non-structural techniques that can reduce dredging requirements. A technique use to dredge material before it becomes a navigation problem is a sediment trap; like the one that has been effective at the mouth of the Chippewa River. Snag removal is also accomplished at some locations when there is a safety concern.

HYDROGRAPHIC SURVEYS

Hydrographic surveys are used to monitor channel conditions, gather and share information, position navigation buoys, determine dredging requirements, calculate quantities, and assess scour. The District has two 36-inch launches that can survey a 50-foot swath with their retractable booms. A typical survey of 60 acres may take several hours. An on-board computer inputs data onto a disk which is transferred to the project office for processing and plotting onto a map of the river. Channel condition surveys usually begin on those reaches that have historically

heavy shoaling, frequent dredging requirements, or other related problems. These surveys are the basic foundation for channel maintenance monitoring and are relied upon throughout the season to track channel conditions. Pre- and post-dredging surveys are performed to determine quantities and assure that dredging has been accomplished as specified.

DREDGING

The timing of dredging depends on the urgency of the situation, other dredging requirements, and location of dredging equipment. A comprehensive dredging schedule/summary is maintained, and is routinely updated as new information becomes available. The dredging schedule is distributed to other agencies through the On-Site Inspection Team. A site specific dredging notice is distributed when plans have been finalized. Placement site requirements are reviewed to assure that evaluations, documentation, permits, and other actions are completed.

When there are acceptable placement sites, the hydraulic pipeline cutter head dredge is the best equipment suited for the UMR because it is the most efficient and cost effective. It does not work as well for small jobs or cuts with distant or small placement sites that cannot be reached with slurry pipes. Mechanical dredging with a backhoe or crane and transport barges is well suited for smaller jobs where placement sites are further than one mile from the dredge cut. Mechanical equipment is easier and faster to set up, but it is usually over twice as costly and not effective for extensive jobs.

The District's primary piece of dredging equipment is the 20-inch cutter head dredge WILLIAM A. THOMPSON, which is used regularly on 1,000 miles of the Mississippi and other navigable waters in the St. Paul, Rock Island, and St. Louis Districts. With booster pumps the maximum effective reach is 6,500 feet of floating pontoon pipeline and 3,700 feet of shoreline pipe. It operates 24-hours a day and production rates usually vary from 10,000 to 13,000 CY per day. The District also has two crane barges that are used for some dredging jobs or emergencies, but most mechanical dredging is done by contract.

PROGRAM COORDINATION

To assure other interests are informed of channel maintenance activities and have an opportunity to provide input, the District coordinates the program primarily through two interagency groups, the On-Site Inspection Team (OSIT) and the River Resources Forum (RRF). Appendix A of the CMMP provides details of interagency notification and coordination procedures. The OSIT was organized during GREAT I for coordination of dredging events and channel maintenance activities. The GREAT study also led to the formation of the RRF which is made up of six Federal and seven State agencies. In 1991, the participating agencies entered into a partnership agreement with a commitment, "... to work together as a trusting, cooperative team to manage the river from a resource-balanced approach in the best interest of the public." Through communication, cooperation, and compromise the District has been attaining RRF consensus and will continue to pursue that support. Close communication with the towing industry is also

necessary to assure that channel maintenance is consistent with their needs. Procedures are established so towing operators can immediately report groundings or problems to the District.

The UMR projects have been authorized by Congress to provide economical transportation for the region and the country and to provide harbors for safety and recreational opportunities. It is the Corp's responsibility to maintain the benefits in the public's best interest. The public relies on the river for more than navigation, including recreational boating, fishing, hunting, camping, residential development, commercial activities, sightseeing, and the enjoyment of nature. The District strives to conduct channel maintenance activities in harmony with those interests and will continue to keep the public informed of proposed actions or significant changes through written notifications and public information meetings.

Table A-1. Dredge cuts within the St. Paul District (locations, status and frequency of maintenance).

Pool-Cut #	Cut Name	Location (river mile)	Projected Annual Volume (1,000 cubic yards) GREAT	CMMP	Frequency of Maintenance (percent) GREAT (1955 to 1974)	CMMP (1970 to 1995)	Year Last Dredged
*** Main Channel Dredging ***							
MN-5	Above Savage Railroad Bridge	14.3-14.7	2.5	6.3	40.0%	26.9%	1992
MN-4	Cargill Slip	12.8-13.6	0.9	0.5	30.0%	3.8%	1983
MN-3C	Peterson's Bar	11.8-12.4	5.8	7.9	25.0%	50.0%	1995
MN-3B	Below Peterson's Bar	11.0-11.6	2.9	3.3	25.0%	15.4%	1983
MN-3A	Above 35W Bridge	10.1	1.0	1.4	25.0%	3.8%	1983
MN-2	4-Mile Cut-Off	4.0	2.0	0.2	10.0%	3.8%	1987
MN-1	Mouth of MN River	0.0-0.5	2.9	1.2	30.0%	7.7%	1993
TOTAL - Minnesota River			18.0	20.8			
SC-3	Hudson	16.1-17.6	19.1	Inactive	15.0%	3.8%	1974
SC-2	Catfish Bar	11.5-12.2	1.1	Inactive	5.0%	0.0%	1968
SC-1	Kinnickinnic Bar	6.0-6.5	11.5	6.5	40.0%	19.2%	1989
TOTAL - St. Croix River			31.7	6.5			
USAF-3	Minneapolis Turning Basin	856.8-857.6	11.2	18.0	35.0%	50.0%	1994
USAF-2	Above Lowry Avenue Bridge	856.4-856.8	17.7	19.7	55.0%	57.7%	1994
USAF-1B	Broadway Avenue Bridge	855.3-856.1	3.5	6.9	65.0%	46.2%	1994
USAF-1A	Above Plymouth Avenue Bridge	854.8-855.5	5.3	9.1	65.0%	38.5%	1994
TOTAL - Pool USAF			37.7	53.7			
1-7B	Lower Approach to LSAF	853.4	0.8	0.1	90.0%	3.8%	1988
1-7A	Washington Avenue Bridge	852.5-853.0	15.3	2.5	90.0%	26.9%	1987
1-6	Above Franklin Avenue Bridge	851.6-852.4	14.7	4.6	55.0%	26.9%	1991
1-5	Below Franklin Avenue Bridge	850.7-851.4	12.2	9.0	45.0%	34.6%	1994
1-4	Above Lake Street Bridge	849.9-850.5	14.2	12.7	50.0%	53.8%	1994
1-3	Below Lake Street Bridge	848.9-849.9	9.8	7.7	55.0%	34.6%	1994
1-2	St. Paul Daymark	848.5-848.9	1.6	3.2	20.0%	23.1%	1988
1-1	Upper Approach to L/D 1	847.7-848.4	7.2	4.5	30.0%	26.9%	1987
TOTAL - Pool 1			75.8	44.3			
2-10	Lower Approach to L/D 1	847.7-848.4	1.5	Inactive	45.0%	0.0%	1958
2-9	Above and Below Smith Avenue	840.0-841.3	8.9	5.2	75.0%	46.2%	1994
2-8	Harriet Island	838.4-839.7	5.0	Inactive	40.0%	0.0%	1968
2-7	St. Paul Barge Terminal	836.4-837.8	50.7	64.9	60.0%	42.3%	1995
2-6	Below Cudahy	831.0-832.4	2.3	Inactive	20.0%	0.0%	1965
2-5B	Grey Cloud Slough	827.5-828.3	3.5	6.8	20.0%	30.8%	1995
2-5A	Robinson Rocks	826.1	3.5	0.3	20.0%	3.8%	1977
2-4	Pine Bend	822.7-823.7	9.5	22.1	25.0%	38.5%	1995
2-3	Boulanger Bend	820.7-821.4	11.4	15.6	10.0%	19.2%	1995
2-2	Boulanger Bend Lower Light	819.0-819.8	6.0	13.1	10.0%	19.2%	1995
2-1	Upper Approach to L/D 2	815.5-815.9	1.0	Inactive	10.0%	0.0%	1969
TOTAL - Pool 2			103.3	128.0			
3-9	Lower Appch. L/D 2	814.9-815.1	1.5	2.4	15.0%	11.5%	1992
3-8	Vermillion River	813.0-815.5	0.3	Inactive	10.0%	0.0%	1955
3-7	Prescott	810.3-811.7	8.1	1.7	30.0%	3.8%	1972
3-6	Pine Coulee	809.5-809.8	3.7	Inactive	10.0%	0.0%	1967
3-5B	Truedale Slough	807.9-808.6	5.0	1.0	30.0%	3.8%	1972
3-5A	Four Mile Island	807.0-807.9	9.8	2.6	30.0%	3.8%	1972
3-4	Big River	804.1-806.0	10.4	3.6	30.0%	15.4%	1995
3-3	Morgan's Coulee	801.9-803.0	11.4	1.4	20.0%	7.7%	1992
3-2	Coulter's Island	800.8-801.9	6.8	7.3	20.0%	26.9%	1995
3-1	Diamond Bluff	798.8-800.4	11.4	11.2	25.0%	26.9%	1995
TOTAL - Pool 3			68.4	31.2			

Table A-1. Dredge cuts within the St. Paul District (locations, status and frequency of maintenance).

Pool-Cut #	Cut Name	Location (river mile)	Projected Annual Volume (1,000 cubic yards) GREAT	Projected Annual Volume (1,000 cubic yards) CMMP	Frequency of Maintenance (percent) GREAT (1955 to 1974)	Frequency of Maintenance (percent) CMMP (1970 to 1995)	Year Last Dredged
*** Main Channel Dredging ***							
4-11	Above Trenton	795.5-796.4	2.3	Inactive	10.0%	0.0%	1957
4-10	Trenton	794.0-794.6	4.5	4.4	10.0%	7.7%	1975
4-9	Cannon River	792.1-793.5	10.7	7.9	20.0%	19.2%	1994
4-8	Above Red Wing High Bridge	790.8-791.2	2.1	2.3	10.0%	3.8%	1972
4-7	Below Red Wing High Bridge	789.5-790.3	9.9	3.4	25.0%	3.8%	1971
4-6	Head of Lake Pepin	785.2-785.4	6.9	0.5	10.0%	5.0%	1990
4-5B	Chippewa Delta	763.2	50.0	68.9	65.0%	26.9%	1995
4-5A	Read's Landing	761.8-763.8	6.6	42.0	65.0%	53.8%	1993
4-4	Above Crat's Island	758.5-759.5	20.0	66.5	70.0%	73.1%	1995
4-3	Above Teepeota Point	757.0-757.9	24.3	30.1	75.0%	53.8%	1995
4-2	Grand Encampment	755.8-756.9	13.1	21.1	35.0%	53.8%	1995
4-1	Beef Slough	753.9-754.6	5.9	4.2	40.0%	26.9%	1995
TOTAL - Pool 4			156.3	251.3			
5-8	Lower Approach L/D 4	752.6-752.8	2.6	0.6	30.0%	11.5%	1976
5-7	Mule Bend	748.6-749.6	9.0	8.4	25.0%	23.1%	1994
5-6	West Newton	747.2-748.2	13.9	5.2	35.0%	23.1%	1995
5-5	Below West Newton	746.0-746.8	9.5	17.6	65.0%	61.5%	1995
5-4	Fisher Island	744.8-746.0	16.8	32.1	65.0%	69.2%	1995
5-3	Lower Zumbro	744.0-744.6	13.0	19.4	60.0%	50.0%	1995
5-2	Sommerfield Island	742.6-743.9	8.3	6.6	30.0%	30.8%	1995
5-1	Mt. Vernon Light	741.2-741.6	3.4	Inactive	15.0%	3.8%	1974
TOTAL - Pool 5			76.5	89.9			
5A-6	Lower Approach to L/D 5	737.7-738.1	1.2	Inactive	5.0%	0.0%	1968
5A-5	Island 58	734.0-735.2	18.1	9.2	50.0%	30.8%	1982
5A-4	Fountain City	733.3-733.8	10.2	1.6	30.0%	3.8%	1972
5A-3	Betsy Slough	731.0-732.0	11.5	20.4	35.0%	76.9%	1995
5A-2	Wild's Bend	730.2-730.7	6.9	15.7	35.0%	61.5%	1995
5A-1	Upper Approach to L/D 5A	728.5-729.5	11.3	Inactive	25.0%	0.0%	1961
TOTAL - Pool 5A			59.2	46.9			
6-6	Lower Approach to L/D 5A	728.5	3.2	Inactive	40.0%	5.0%	1983
6-5	Island 71 and Boat Harbor	726.0-726.5	2.4	Inactive	30.0%	0.0%	1968
6-4	Above Winona Railroad Bridge	723.9-724.2	4.3	Inactive	20.0%	3.8%	1970
6-3	Below Winona Railroad Bridge	723.4-723.8	10.9	8.6	30.0%	23.1%	1995
6-2	Gravel Point	721.8-722.9	2.0	0.6	15.0%	3.8%	1972
6-1	Homer	720.4-721.1	6.8	5.8	30.0%	15.4%	1991
TOTAL - Pool 6			29.6	15.0			
7-7	Lower Approach to L/D 6	714.0-714.3	2.3	3.2	10.0%	15.4%	1993
7-6	Richmond Island	711.4-712.3	16.3	4.9	35.0%	15.4%	1982
7-5	Queen's Bluff	710.3-710.7	2.1	Inactive	10.0%	0.0%	1964
7-4	Winter's Landing	707.4-709.3	11.7	25.6	40.0%	57.7%	1995
7-3	Dakota	706.1-706.6	9.4	7.3	45.0%	34.6%	1995
7-2B	Head of Dresbach	704.0-705.3	4.5	8.3	25.0%	38.5%	1995
7-2A	Lower Dresbach Island	703.0-703.7	4.5	3.5	25.0%	23.1%	1995
7-1	Upper Approach to L/D 7	702.5-702.9	3.5	1.0	10.0%	7.7%	1989
TOTAL - Pool 7			54.3	53.8			

Table A-1. Dredge cuts within the St. Paul District (locations, status and frequency of maintenance).

Pool-Cut #	Cut Name	Location (river mile)	Projected Annual Volume (1,000 cubic yards) GREAT	CMMP	Frequency of Maintenance (percent) GREAT (1955 to 1974)	CMMP (1970 to 1995)	Year Last Dredged
*** Main Channel Dredging ***							
8-10	LaCrosse Railroad Bridge	699.8-700.4	7.0	8.9	25.0%	30.8%	1992
8-10a	LaCrosse	698.6-698.7	—	0.4	—	5.0%	1989
8-9	Sand Slough	694.3-695.0	4.3	3.0	20.0%	3.8%	1970
8-8	Root River	692.2-693.3	2.8	Inactive	10.0%	0.0%	1965
8-7	Picayune Island	691.4-692.4	5.3	3.0	15.0%	7.7%	1973
8-6	Above Brownsville	689.9-690.8	22.6	22.4	60.0%	53.8%	1995
8-5	Brownsville	688.7-689.4	16.4	19.1	55.0%	69.2%	1995
8-4	Head of Raft Channel	687.5-688.7	25.5	15.8	50.0%	42.3%	1994
8-3	Deadman's Slough	686.5-687.5	6.0	1.9	15.0%	7.7%	1989
8-2	Crosby Slough	684.7-685.2	1.1	Inactive	5.0%	0.0%	1963
8-1	Warner's Landing	683.5-683.8	1.0	Inactive	5.0%	0.0%	1963
TOTAL - Pool 8			92.0	74.5			
9-10	Lower Approach to L/D 8	678.7-679.2	2.3	0.3	10.0%	7.7%	1988
9-9	Island 126	677.5-678.4	7.6	4.6	25.0%	7.7%	1989
9-8	Twin Island	676.0-676.6	9.1	—	45.0%	0.0%	1969
9-7	Below Twin Island	675.4-675.9	0.3	Inactive	5.0%	3.8%	1970
9-6	Battle Island	671.0-672.0	9.1	2.9	30.0%	11.5%	1980
9-5	Desoto	667.4-668.5	2.5	Inactive	5.0%	0.0%	1958
9-4	Indian Camp Light	665.0-665.8	12.9	16.3	25.0%	57.7%	1995
9-3	Lansing Upper Light	663.8-664.9	11.7	29.6	60.0%	57.7%	1995
9-2	Above Atchafalya	660.3-660.8	1.2	Inactive	5.0%	3.8%	1970
9-1	Crooked Slough	653.6-654.6	1.3	Inactive	5.0%	0.0%	1964
TOTAL - Pool 9			58.0	53.7			
10-10	Lower Approach to L/D 9	647.8-647.9	0.2	Inactive	5.0%	0.0%	1959
10-9	Hay Point	646.0-646.6	6.8	3.1	25.0%	7.7%	1972
10-8	Jackson Island	643.7-644.7	11.9	8.6	25.0%	11.5%	1981
10-7	Mississippi Gardens	642.7-643.4	4.1	6.8	10.0%	7.7%	1976
10-6	East Channel	633.2-635.8		Deferred	5.0%	3.8%	1976
10-5	McGregor	633.2-637.5	1.6	Inactive	5.0%	0.0%	1964
10-4	Wyalusing Bend Light	628.9-629.3	0.4	Inactive	5.0%	3.8%	1970
10-3	Wyalusing	627.3-628.0	3.1	1.3	30.0%	3.8%	1970
10-2	McMillan Island	618.4-619.6	5.2	14.6	20.0%	38.5%	1995
10-1	Upper Approach to L/D 10	615.1-616.0	1.3	Inactive	5.0%	3.8%	1973
TOTAL - Pool 10			34.6	34.4			
TOTAL For Main Channel			895.4	904.0			
*** Authorized Harbor Dredging ***							
2	St. Paul SBH	839.6	—	3.9	—	42.3%	1995
3	Hastings SBH	813.2	—	0.5	—	7.7%	1984
4	Red Wing Comm. Harbor	791.5	—	0.3	—	7.7%	1978
4	Red Wing SBH	791.0	—	1.1	—	3.8%	1982
4	Bay City SBH	786.8	—	Deferred	—	0.0%	—
4	Lake City SBH	772.5	—	0.0	—	0.0%	1965
4	Pepin SBH	767.0	—	0.1	—	7.7%	1980
4	Wabasha SBH	760.5	—	0.0	—	0.0%	—
4	Alma SBH	754.0	—	0.1	—	3.8%	1970
6	Winona Comm. Harbor	726.3	—	0.1	—	7.7%	1982
6	Winona SBH	726.1	—	2.0	—	53.8%	1993
9	Lansing SBH	663.5	—	0.0	—	0.0%	—
10	Prairie Du Chien Comm. Harbor	635.2	—	Deferred	—	3.8%	1976
10	Prairie Du Chien SBH	636.0	—	0.0	—	0.0%	—
TOTAL - Boat Harbors				8.1			

Table A-2. Dredged material placement sites for the Channel Maintenance Management Plan (CMMP).

Location	Site Name	Endorsement	Total (acres) Wetland	Disturbed Floodplain	Upland	Both
MN-13.5-RMP	Cargill	GREAT	7	0	0	7
MN-12.1-RMP	Kraemer Site		0	0	5	5
MN-10.1-RMP	NSP Site		0	0	7	7
MN-7.3-RMP	Hwy. 77 Bridge		0	0	4	4
			7	0	16	23
SC-6.7-LWP	Kinnickinnic Bar Upper	GREAT	0	4	0	4
SC-6.5-LWP	Kinnickinnic Bar Lower	GREAT	0	7	0	7
			0	11	0	11
U-856.6-RMP	USAF Site		0	0	7	7
			0	0	7	7
1-853.2-LMP	Pool 1 Site	RRF - 3/84	0	0	2	2
1-851.3-LME	Below Franklin Avenue	GREAT, RRF - 3/84	0	5	0	5
1-849.5-RME	Below Lake Street	GREAT, RRF - 3/84	0	4	0	4
			0	9	2	11
2-840.4-RMP	Highbridge	GREAT	0	0	4	4
2-838.2-RMP	Northport (1)	GREAT	0	0	6	6
2-837.5-RMP	St. Paul Barge Terminal	GREAT	28	0	0	28
2-836.8-RMP	Holman Field (2)	GREAT	110*	0	0	0
2-836.3-RMP	Southport	GREAT	18	0	0	18
2-823.8-LMT	Pine Bend		0	8	0	8
2-823.8-RMP	C.F. Industries (3)	OSIT - 9/94	0	1	6	7
2-822.5-LMP	Shiely Pit		0	0	15	15
2-821.5-LMT	Upper Boulanger		0	4	0	4
2-821.1-LMT	Lower Boulanger		3	5	0	8
			49	18	31	98
3-815.1-RMP	Hastings	RRF - 4/90	0	0	1	1
3-814.7-RMP	Koch		0	0	7	7
3-813.2-RMP	Hastings Harbor	GREAT	0	0	11	11
3-811.5-LMP	Point Douglas	GREAT	4	0	6	10
3-808.4-LWP	Dry Run Slough	GREAT	13	0	0	13
3-802.3-RME	Morgans	GREAT	3	0	0	3
3-801.7-LWE	Coulters	GREAT	2	1	0	3
3-799.2-RMT	Corps Island	RRF - 12/95	2	5	0	7
3-798.0-LWP	County/Private Gravel Pit		0	0	31	31
			24	6	56	86
4-794.7-RMP	Red Wing Yacht Club	GREAT, RRF - 11/85	2	4	0	6
4-791.6-RMP	Red Wing Commercial Harbor	GREAT, RRF - 11/85	2	0	11	13
4-788.5-RMP	Colvill Park (4)	GREAT	0	0	5	5
4-762.7-LWT	Reads Landing	GREAT, RRF - 4/82	0	22	0	22
4-761.1-RMP	Carrels Pit (5)	GREAT	0	0	18	18
4-761.0-RMP	Wabasha Gravel Pit	GREAT, RRF - 4/82	10	0	76	86
4-760.2-RMP	MDNR.2 (1)	RRF - 10/83	0	0	30	30
4-759.5-RMP	(1)	GREAT	0	0	6	6
4-759.3-RMP	(1)	RRF - 10/83	0	3	0	3
4-759.3-LWT	Crats Island	RRF - 3/83, 11/85	0	22	0	22
4-757.5-LW	Teepeeota Point	GREAT, RRF - 6/83	0	46	0	46
4-756.5-LWT	Grand Encampment	GREAT, RRF - 6/83	0	8	0	8
4-754.0-LWP	Alma Marina	GREAT, RRF - 6/83	3	4	0	7
			17	109	146	272
5-749.8-RMP	West Newton Chute	GREAT, RRF - 10/83	0	0	39	39
5-748.0-RMT	Above West Newton	GREAT	0	14	0	14
5-745.8-RMT	Above Fisher Island	GREAT, RRF - 9/85	0	14	0	14
5-744.7-LWT	Lost Island	RRF - 3/83, 9/85	0	18	0	18
5-744.0-RMP	Weaver Bottoms (6)	GREAT, RRF - 9/85	108*	0	0	0
			0	46	39	85

Table A-2. Dredged material placement sites for the Channel Maintenance Management Plan (CMMP).

Location	Site Name	Endorsement	Total (acres) Wetland	Disturbed Floodplain	Upland	Both
5A-738.2-RMP	L/D 5 Site	GREAT, RRF - 6/83	1	1	0	2
5A-734.5-LWE	Island 58	GREAT, RRF - 12/86	0	3	0	3
5A-733.5-LWP	Fountain City Service Base	RRF - 12/86	2	0	0	2
5A-731.9-LWP	Fountain City 1	GREAT, RRF - 10/83	0	6	0	6
5A-731.8-LWP	Fountain City 2	GREAT, RRF - 10/83	22	0	0	22
5A-730.5-LWT	Wilds Bend	GREAT, RRF - 3/84	0	8	0	8
			25	18	0	43
6-726.3-RMP	Winona Commercial Harbor		0	0	6	6
6-726.0-LMP	Winona Small Boat Harbor (7)	GREAT	0	1	0	1
6-720.5-RMP	Homer	GREAT	8	2	0	10
			8	3	6	17
7-714.1-LWP	Trempealeau	GREAT, RRF - 3/84	5	0	0	5
7-713.1-RMP	Hot Fish Shop	GREAT, RRF - 3/84	0	3	0	3
7-708.7-LWE	Winters Landing	GREAT	1	1	0	2
7-707.3-RMP	Dakota Boat Ramp	RRF - 3/84, 6/86	5	0	0	5
7-706.5-RMT	Dakota Island	GREAT, RRF - 6/86	0	8	0	8
			11.0	12.0	0	23
8-695.7-LWP	Isle La Plume	GREAT, RRF - 10/83	0	0	9	9
8-690.4-LWT	Above Brownsville	GREAT	0	14	0	14
8-688.7-RMP	Brownsville Containment	GREAT, RRF - 3/84	17	17	2	36
			17	31	11	59
9-677.7-LWP	Genoa Power Plant	GREAT, RRF - 6/86	0	0	2	2
9-670.5-LWP	Blackhawk Park	RRF - 6/86	41	7	21	69
9-665.8-RIE	Indian Camp Light	GREAT	0	3	0	3
9-664.3-RIT	Lansing	GREAT	0	9	0	9
9-663.5-LWP	Lansing Highway Bridge	RRF - 12/92	5	0	0	5
			46	19	23	88
10-647.1-LWP	Varo Property	GREAT, RRF - 9/85	2	0	2	4
10-644.5-RIE	Jackson Island	GREAT	0	0	3	3
10-643.5-LWI	Jackson Rehandle	RRF - 9/85	3	0	0	3
10-642.4-LWP	Mississippi Gardens	GREAT, RRF - 9/85	0	0	4	4
10-635.0-LWP	Prairie Muncipal Dock (8)	RRF - 4/82	0	5	0	5
10-628.0-LWP	Wyalusing Pit	GREAT, RRF - 9/85	0	0	6	6
10-627.8-LWP	Wyalusing Beach	RRF - 9/85	0	2	0	2
10-618.7-RIT	McMillan Island	RRF - 9/95	2	3	0	5
10-618.0-RIP	Buck Creek	RRF - 9/95	2	0	8	10
			9	10	23	42
		TOTAL	213	292	360	865

(1) These sites have been filled to capacity during past placement events.
(2) Placement of materials at this site is/was conditional upon landowner meeting all Federal, State and local regulatory requirements. Mitigation for wetland acres filled at this site using dredged materials provided by the District is the responsibility of the landowner. Acreages affected are not included in acreage totals.
(3) Site 2-823.8-RMP is privately owned. The landowner has discretion over how much material is placed at the site and where it is placed.
(4) Placement of materials at this site would be contingent upon the city of Red Wing's demand for material.
(5) Site 4-761.1-RMP would be used to supplement the CMMP and provide greater longevity to the recommended sites.
(6) The effects of the Weaver Bottoms project have been assessed under a separate NEPA document; acres affected are not included in totals.
(7) Use of site 6-726.0-LMP may not be required once site 6-726.3-RMP is fully developed and a long-term real estate agreement is obtained.
(8) Dredging in the East Channel has been deferred and developed of this site is not anticipated (see U.S. Army Corps of Engineers/Wisconsin Department of Natural Resources 1996).

Table A-3. Placement site actions, five-year plan (March 1997).

	PLACEMENT SITE ACTIONS, FIVE YEAR PLAN										
Site Name		X	1997	X	1998	X	1999	X	2000	X	2001
General			CWA-E								
			PUB-B								
			GPL-F								
MN-13.5-RMP	Cargill		CAP-C		CAP-C		CAP-C		CAP-C		CAP-C
			SPR-D								
			INS-O								
			GPL-O								
MN-12.1-RMP	Kraemer Site		CAP-C		CAP-C		CAP-C		CAP-C		CAP-C
MN-10.1-RMP	NSP Site		SPR-U		CAP-C		CAP-C		CAP-C		CAP-C
			CAP-C								
			INS-O								
			GPL-O								
MN-7.3-RMP	Hwy. 77 Bridge		CAP-C		CAP-C		CAP-C		CAP-C		CAP-C
			REA-P								
			INS-O								
			GPL-O								
SC-6.7-LWP	Kinnickinnic Bar Upper				REA-B		REA-P				
SC-6.5-LWP	Kinnickinnic Bar Lower				REA-B		REA-P				
U-856.6-RMP	USAF Site		CAP-C		CAP-C		CAP-C		CAP-C		CAP-C
							REA-P				
1-853.2-LMP	Pool 1 Site		CAP-C		CAP-C		CAP-C		CAP-C		CAP-C
					INS-S						
1-851.3-LME	Below Franklin Avenue										
1-849.5-RME	Below Lake Street										
2-840.4-RMP	Highbridge		CAP-C		CAP-C		CAP-C		CAP-C		CAP-C
			GPL-O								
			REA-P								
2-837.5-RMP	St. Paul Barge Terminal										
2-836.8-RMP	Holman field										
2-836.3-RMP	Southport		SPR-D		REA-P						
			SPR-U								
			GPL-O								
			REA-B								
2-823.8-RMP	C.F. Industries		REA-P		REA-P		REA-P		REA-P		REA-P
							REA-P				
2-823.8-LMT	Pine Bend		CAP-S		EXC-C						
			REA-F								
			SPR-R								
			EXC-S								
			EXC-C								
2-822.5-LMP	Shiely Pit		GPL-O								
			REA-P								
2-821.5-LMT	Upper Boulanger		CAP-S		EXC-C						
			EXC-S								
			REA-F								
2-821.1-LMT	Lower Boulanger		EXC-S		EXC-C						
			CAP-S								
			SPR-R								
			REA-F								
3-815.1-RMP	Hastings										
3-814.7-RMP	Koch		GPL-P		REA-P				LAN-P		LAN-P
			INS-O						LAN-C		LAN-C
			REA-B								
3-813.2-RMP	Hastings Harbor						REA-B		REA-F		
3-811.5-LMP	Point Douglas						REA-B		REA-F		
3-808.4-LWP	Dry Run Slough						REA-B		REA-F		
3-802.3-RME	Morgans										
3-801.7-LWE	Coulters				REA-B		REA-F				
					INS-O						

Table A-3. Placement site actions, five-year plan (March 1997).

	PLACEMENT SITE ACTIONS, FIVE YEAR PLAN										
Site Name		X	1997	X	1998	X	1999	X	2000	X	2001
3-798.0-LWP	Co./Private Pits		REA-P								
3-799.2-RMT	Corps Island		EXC-S								
			EXC-C								
4-794.7-RMP	Red Wing Yacht Club						REA-B		REA-P		
4-791.6-RMP	Red Wing Commercial Harbor		GPL-O		PUB-K		LAN-P				
			REA-P				LAN-C				
4-788.5-RMP	Colvill Park		REA-P								
4-762.7-LWT	Reads Landing		LAN-P		LAN-C						
					SPR-E						
4-761.1-RMP	Carrels Pit				REA-B		REA-F				
4-761.0-RMP	Wabasha Gravel Pit		LAN-P		SPR-C		PUB-K				
			LAN-C								
4-760.2-RMP	MDNR.2 (site filled)										
4-759.5-RMP	4.19 (site filled)										
4-759.3-RMP	4.17 (site filled)										
4-759.3-LWT	Crats Island		LAN-P		SPR-E						
					LAN-C						
4-757.5-LW	Teepeeota Point		CAP-S				LAN-C				
			SPR-R				LAN-P				
4-756.5-LWT	Grand Encampment				LAN-P						
					LAN-C						
4-754.0-LWP	Alma Marina		PUB-K								
			LAN-P								
			SPR-A								
			LAN-C								
5-749.8-RMP	West Newton Chute		SPR-D		CAP-S						
			SPR-U								
			LAN-P								
			LAN-C								
			REA-F								
5-748.0-RMT	Above West Newton		SPR-R						EXC-S		EXC-C
5-745.8-RMT	Above Fisher Island										
5-744.7-LWT	Lost Island										
5-744.0-RMP	Weaver Bottoms										
5A-738.2-RMP	L/D 5 Site						EXC-P				
5A-734.5-LWE	Island 58						REA-B		CAP-S		
							EXC-P		EXC-G		
									REA-P		
5A-733.5-LWP	Ft. City Service Base						SPR-E		CAP-S		CAP-S
5A-731.9-LWP	Fountain City 1		PUB-K								
5A-731.8-LWP	Fountain City 2						REA-B		REA-P		REA-P
5A-730.5-LWT	Wilds Bend		EXC-S		EXC-C						
			SPR-R								
			CAP-S								
6-726.3-RMP	Winona Commercial Harbor		INS-S		REA-P						
6-726.0-LMP	Winona Harbor										REA-P
6-720.5-RMP	Homer		GPL-O		REA-P						
			REA-B								
7-714.1-LWP	Trempealeau				PUB-S						
7-713.1-RMP	Hot Fish Shop		REA-P								
7-708.7-LWE	Winters Landing										
7-707.3-RMP	Dakota Boat Ramp		REA-P		SPR-A		LAN-P				
			GPL-O		SPR-D		LAN-C				
							PUB-K				
7-706.5-RMT	Dakota Island		EXC-S		EXC-C						
			REA-P								
8-695.7-LWP	Isle La Plume		GPL-S								
8-690.4-LWT	Above Brownsville		CAP-S		EXC-S		EXC-C				
			SPR-R								
8-688.7-RMP	Brownsville Containment		SPR-A		PUB-K						
9-677.7-LWP	Genoa Power Plant		GPL-O				REA-P				

Table A-3. Placement site actions, five-year plan (March 1997).

	PLACEMENT SITE ACTIONS, FIVE YEAR PLAN										
Site Name		X	1997	X	1998	X	1999	X	2000	X	2001
9-670.5-LWP	Blackhawk Park		REA-B		REA-F		GPL-U		SPR-A		
					CAP-S		LAN-P		PUB-K		
									LAN-C		
9-665.8-RIE	Indian Camp Light										
9-664.3-RIT	Lansing		CAP-S		LAN-P		LAN-C		EXC-P		EXC-P
									EXC-G		EXC-G
9-663.5-LWP	Lansing Hwy Bridge		CAP-S		PUB-K						
			SPR-A		LAN-C						
			SPR-R		LAN-P						
10-647.1-LWP	Varo Property		REA-B		REA-F						
			INS-O								
10-644.5-RIE	Jackson Island										
10-643.5-LWI	Jackson Rehandle										
10-642.4-LWP	Mississippi Gardens		REA-B		REA-F		SPR-A				
			INS-O				SPR-D				
10-635.0-LWP	Prairie Municipal Dock						REA-B		REA-P		
10-628.0-LWP	Wyalusing Pit						REA-B		REA-P		
10-627.8-LWP	Wyalusing Beach						REA-B		REA-P		
10-618.7-RIT	McMillan Island		EXS-S		EXC-C		LAN-P		LAN-C		LAN-C
10-618.0-RIP	Buck Creek		REA-F		SPR-D		LAN-P		LAN-C		LAN-C
					SPR-A						

Code Key	
CAP-C	Check status of capacity
CAP-S	Survey to determine capacity
CWA-C	Clean Water Act compliance
CWA-E	Clean Water Act evaluation
EXC-C	Excavation by contract
EXC-G	Excavation by government
EXC-P	Excavation planning
EXC-S	Excavation specifications for contract
GPL-F	General planning floodplain evaluation
GPL-O	General planning for operations at sites
GPL-S	General planning status (outside parties)
GPL-U	General planning update contract map
INS-O	Inspection by OSIT
INS-S	Inspection of site structures
LAN-C	Landscape contract
LAN-P	Landscape planning
PUB-B	Public beneficial use notice
PUB-K	Public information kiosk at site
PUB-S	Public sign fabrication
REA-F	Real estate fee title purchase
REA-B	Real estate begin acquisition process
REA-P	Real estate permit acquisition
SPR-D	Site preparation of dike
SPR-C	Site preparation involving clearing/cleaning
SPR-U	Site preparation of unloading ramp
SPR-A	Site preparation for access improvement
SPR-E	Site preparation involving erosion protection (rock)
SPR-R	Site preparation involving reshaping
SPR-M	Site preparation mitigation

Table A-4 Channel control structures study and implementation schedule (March 97)

Study	FY97				FY98				FY 99				FY 00				FY01			
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
Lower Pool 8				DD	FD				PS		IC		CC							
Pool 5		DP	FP					DD	FD				PS		IC		CC			
L. Pool 3/U. Pool 4							SI		DP	FP					DD	FD		PS	IC	
Lower Pool 4										SI		DP	FP					DD	FD	
Lansing Reach												SI		DP	FP					DD
Pool 7															SI		DP	FP		
Pool 5A/Pool 6																		SI		DP
McMillan Island																				SI
Lower Pool 2																				
Unidentified #1																				
Unidentified #2																				

Study	FY02				FY03				FY 04				FY 05				FY06			
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
L. Pool 3/U. Pool 4	CC																			
Lower Pool 4	PS		IC		CC															
Lansing Reach	FD			PS			IC		CC											
Pool 7			DD	FD		PS	IC		CC											
Pool 5A/Pool 6	FP						DD	FD		PS	IC		CC							
McMillan Island		DP	FP					DD	FD			PS			IC		CC			
Lower Pool 2			SI		DP	FP					DD	FD		PS	IC		CC			
Unidentified #1						SI		DP						FP	FD			PS	IC	
Unidentified #2								SI		DP						DD	FD			
Unidentified #3											SI		DP	FP					DD	FD
Unidentified #4														SI		DP	FP			

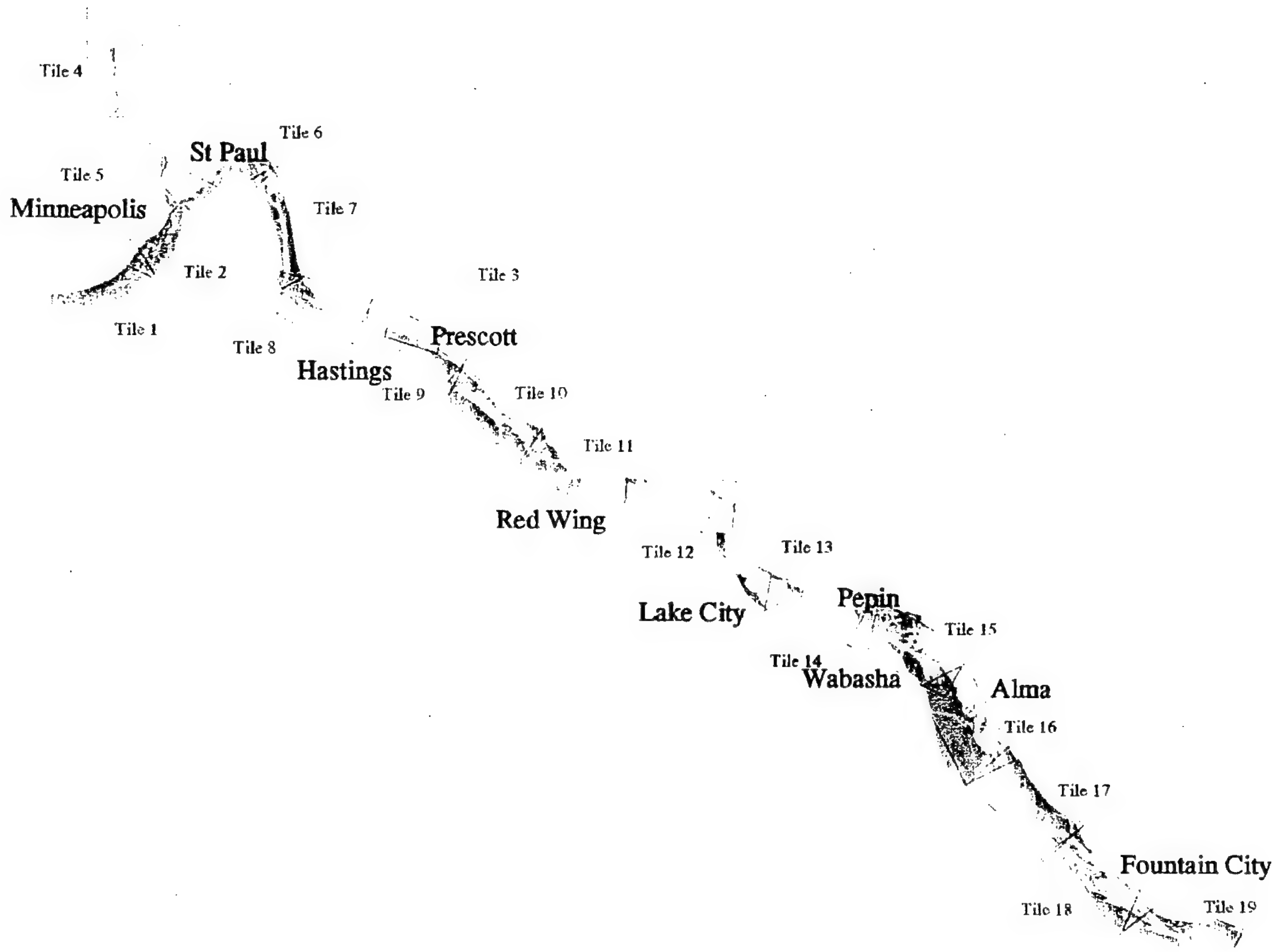
SI=study initiation
DP=draft Problem Appraisal Report
FPI=final Problem Appraisal Report
DD=draft Definite Project Report
FD=final Definite Project Report
PS=completion of plans and specifications
IC=initiation of construction
CC=construction completion

APPENDIX A

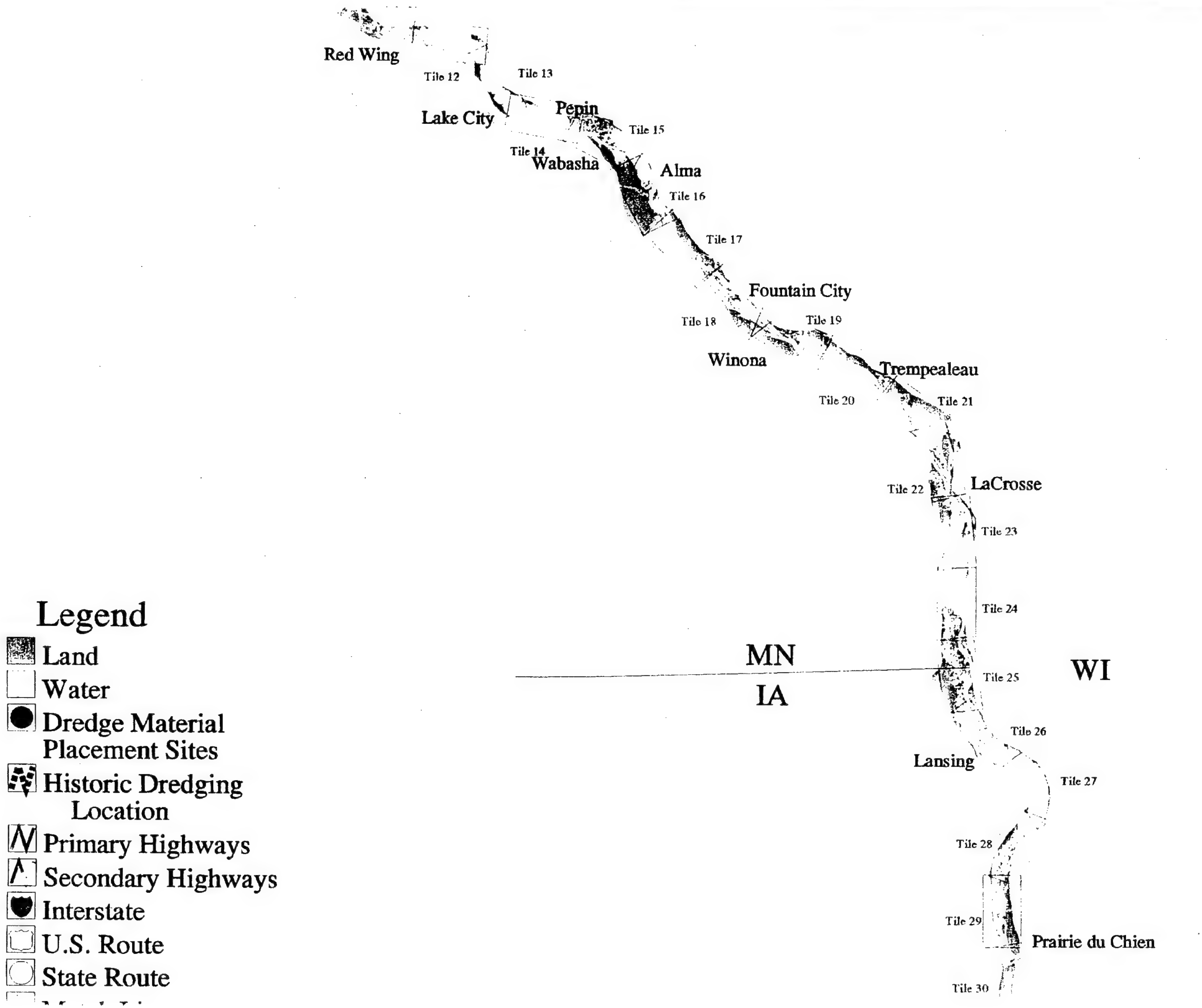
Attachment 1

Channel Maintenance Management Plan - Dredge Cut and Placement Site Location Maps

Channel Maintenance Management Plan
Dredge Cut and Placement Site Location Maps
Index of Maps and Legend



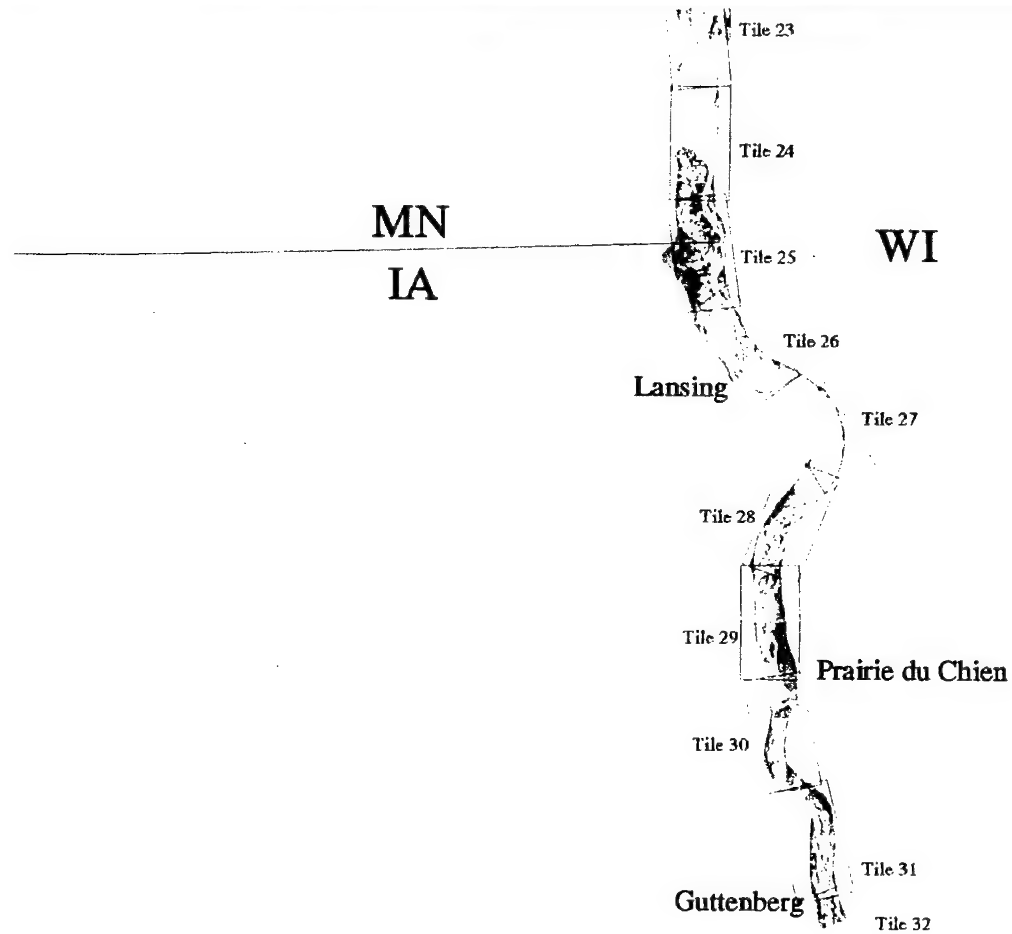
(1)


Red Wing
Tile 12
Tile 13
Lake City
Pepin
Tile 15
Tile 14
Wabasha
Alma
Tile 16
Tile 17
Fountain City
Tile 18
Tile 19
Winona
Trempealeau
Tile 20
Tile 21
Tile 22
LaCrosse
Tile 23
Tile 24
MN
IA
Tile 25
WI
Tile 26
Lansing
Tile 27
Tile 28
Tile 29
Prairie du Chien
Tile 30
Legend
Land
Water
Dredge Material Placement Sites
Historic Dredging Location
Primary Highways
Secondary Highways
Interstate
U.S. Route
State Route

(3)

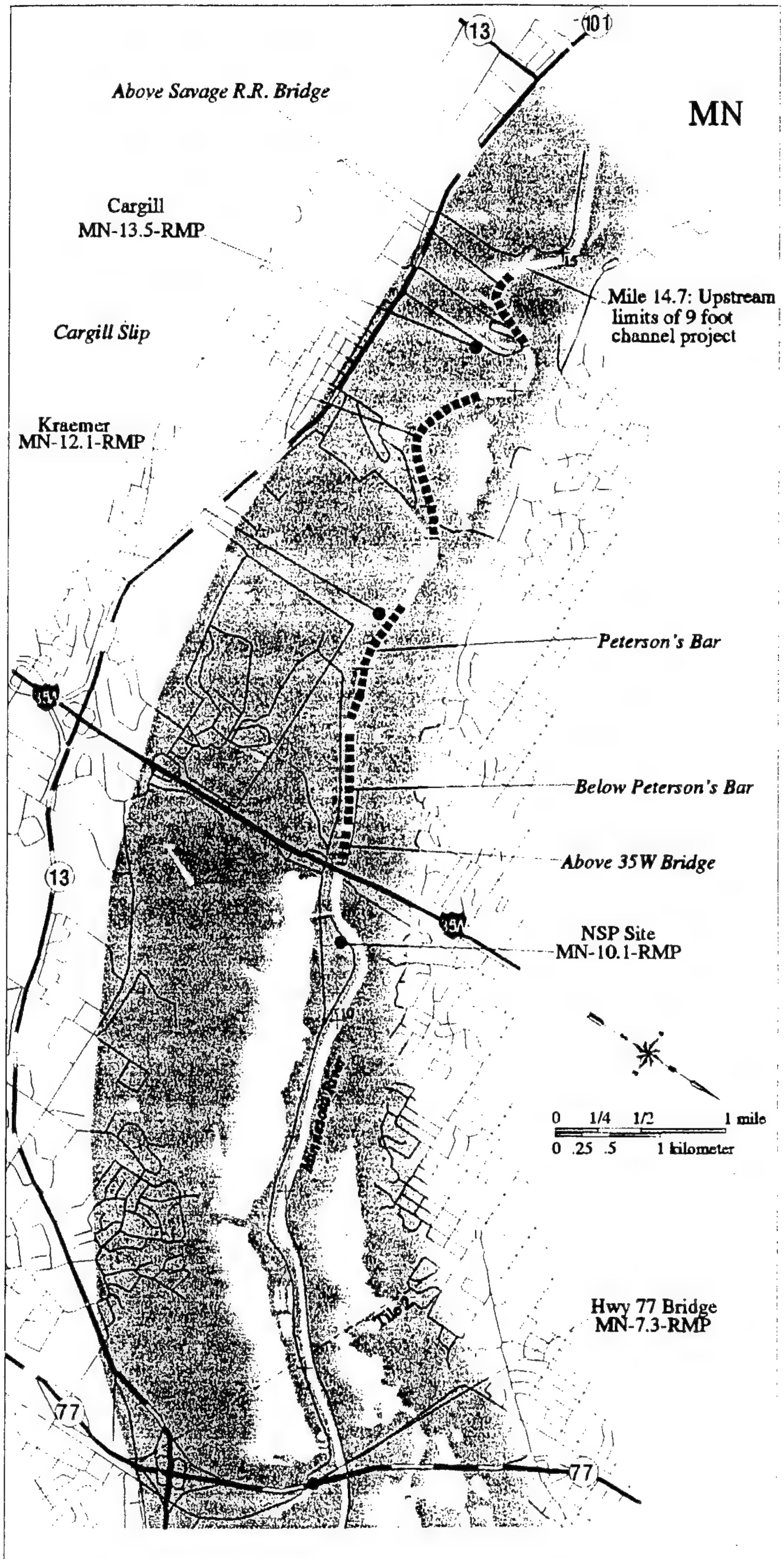
Legend

- Land
- Water
- Dredge Material Placement Sites
- Historic Dredging Location
- Primary Highways
- Secondary Highways
- Interstate
- U.S. Route
- State Route
- Match Line



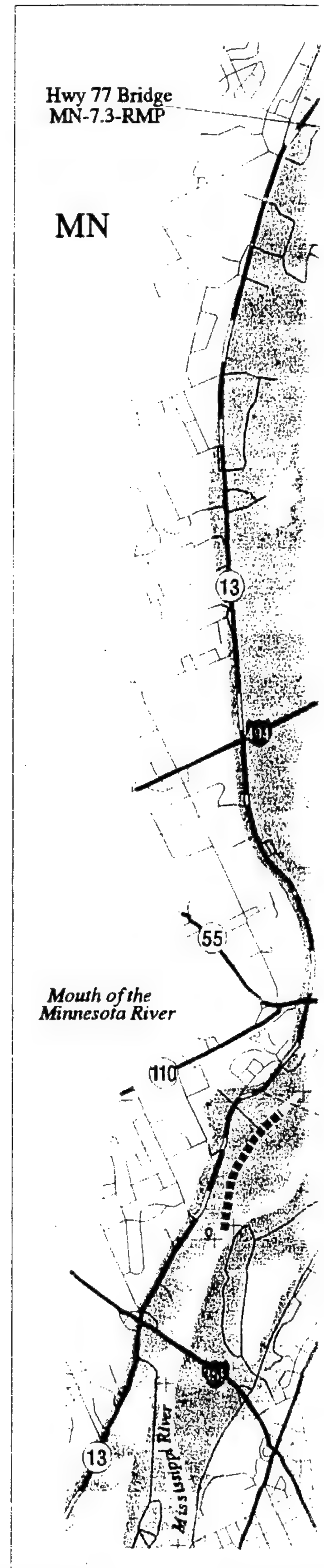
Data for these maps were interpreted from aerial photographs. Photos used as base information for pools 1-3, 9, and 10 were taken in 1975. Photos used for pools 4-8 were taken in 1989. Data for the Minnesota River and upper pool 1 were compiled from the National Wetlands Inventory / U.S. Fish and Wildlife Service.

Index of Maps and Legend

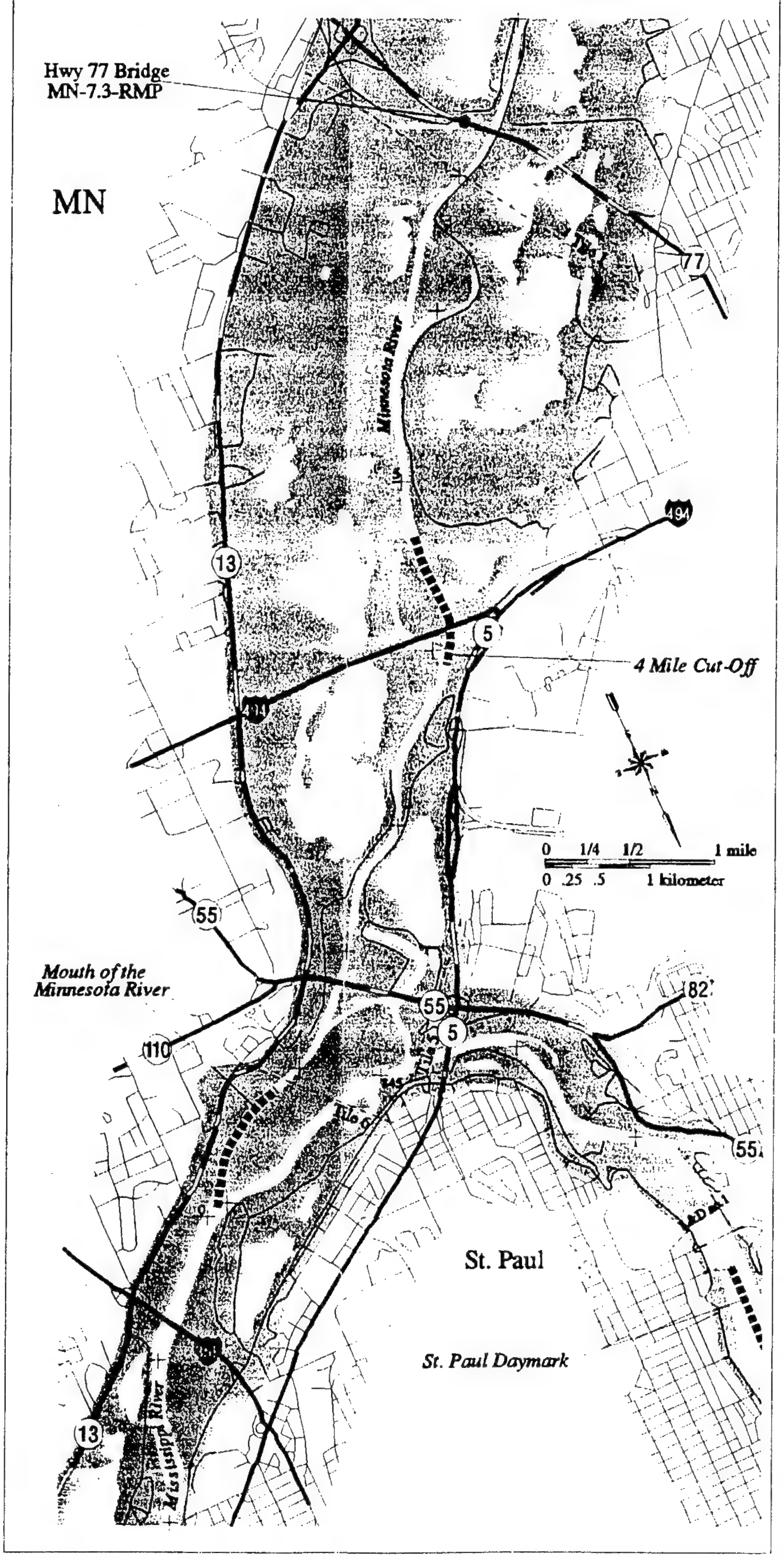


13
101
Above Savage R.R. Bridge
MN
Cargill
MN-13.5-RMP
Mile 14.7: Upstream limits of 9 foot channel project
Cargill Slip
Kraemer
MN-12.1-RMP
Peterson's Bar
Below Peterson's Bar
Above 35W Bridge
NSP Site
MN-10.1-RMP
0 1/4 1/2 1 mile
0 .25 .5 1 kilometer
Hwy 77 Bridge
MN-7.3-RMP
77

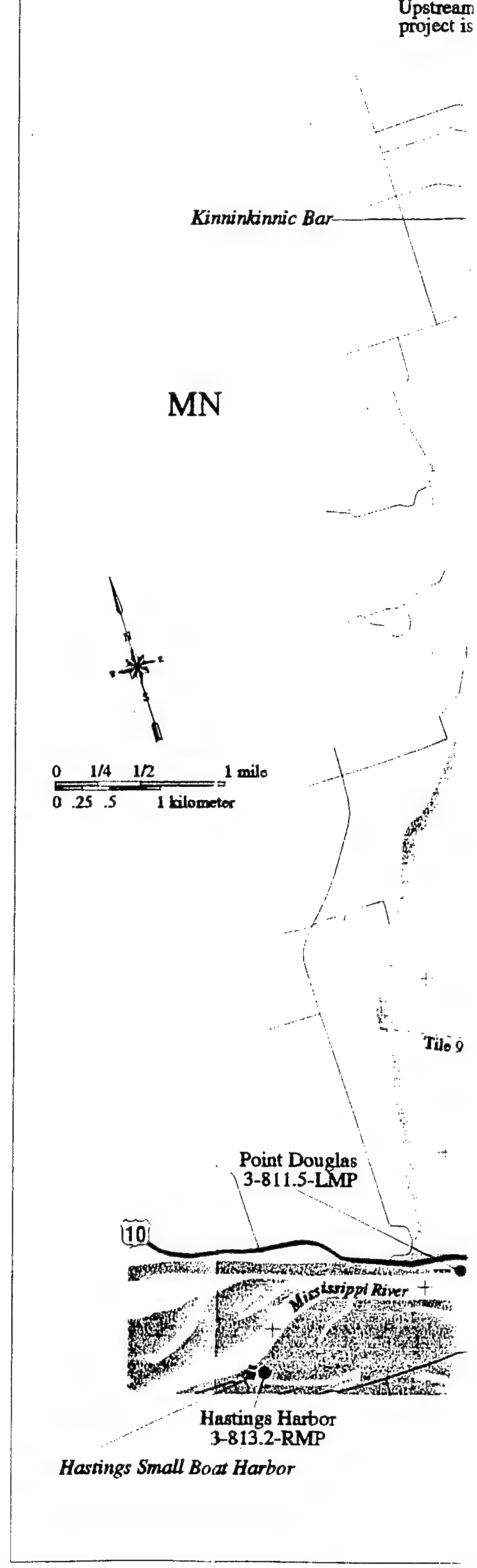
Tile 1



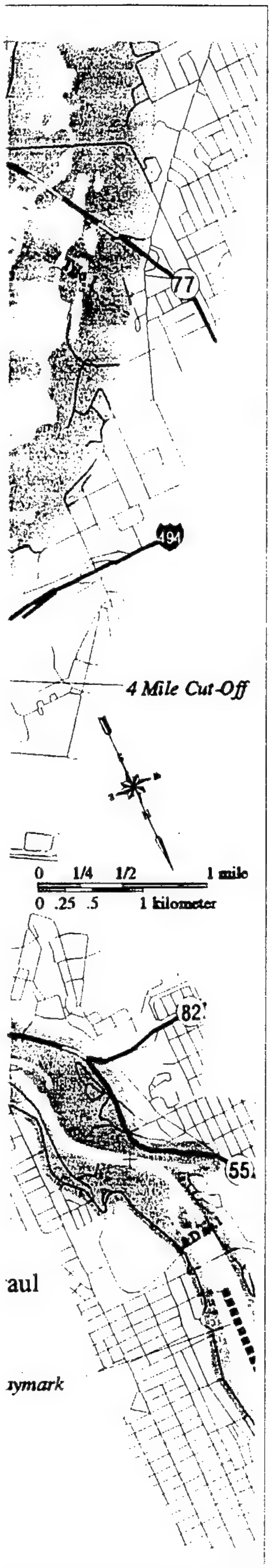
Hwy 77 Bridge
MN-7.3-RMP
MN
13
55
Mouth of the
Minnesota River
110
Mississippi River

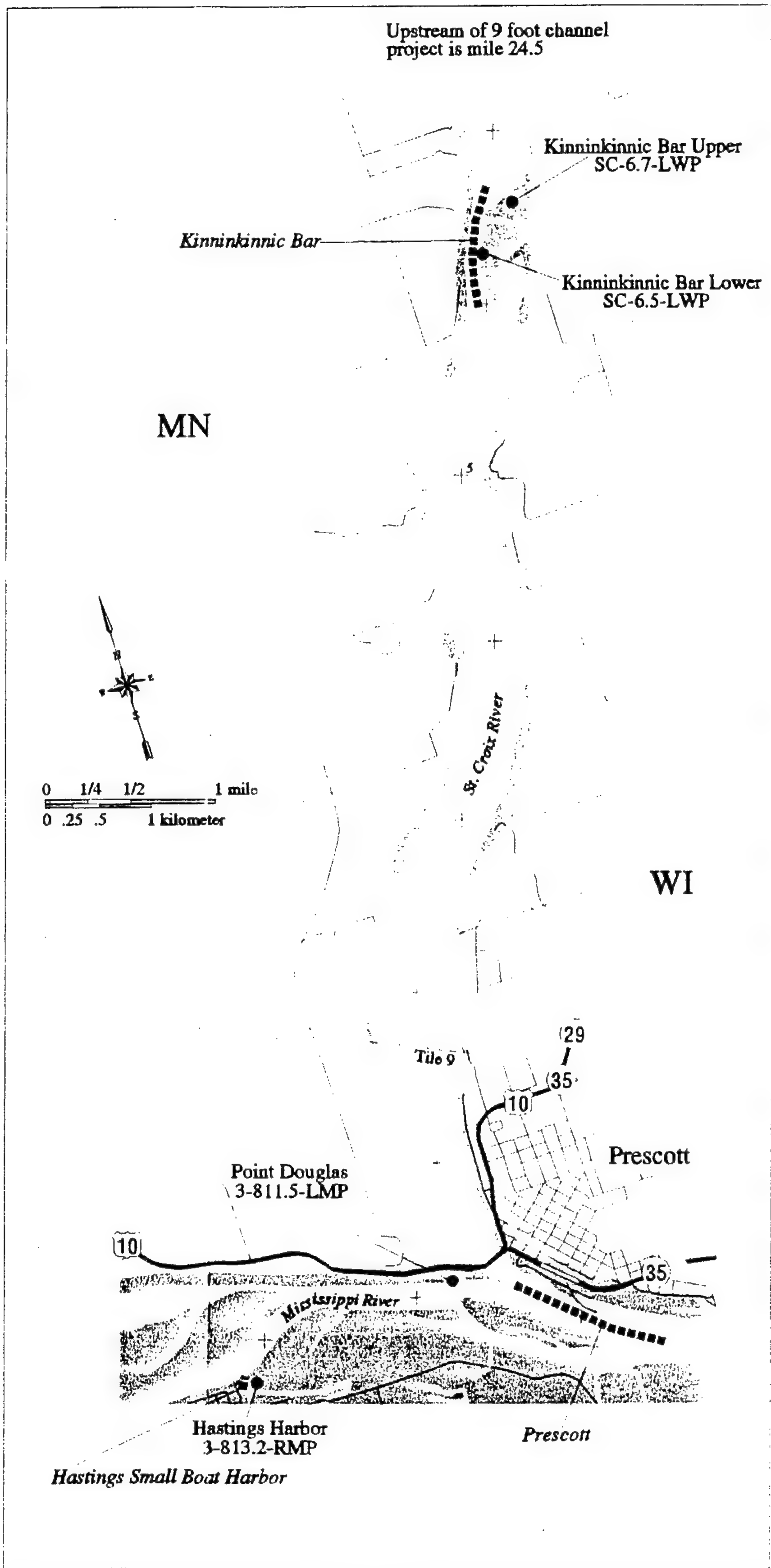

Hwy 77 Bridge
MN-7.3-RMP
MN
77
Minnesota River
494
13
5
4 Mile Cut-Off
0 1/4 1/2 1 mile
0 .25 .5 1 kilometer
55
Mouth of the
Minnesota River
82
110
5
55
St. Paul
St. Paul Daymark
13
Mississippi River

Tile 2


Upstream
project is
Kinninkinnic Bar
MN
0 1/4 1/2 1 mile
0 .25 .5 1 kilometer
Tile 9
Point Douglas
3-811.5-LMP
10
Mississippi River
Hastings Harbor
3-813.2-RMP
Hastings Small Boat Harbor

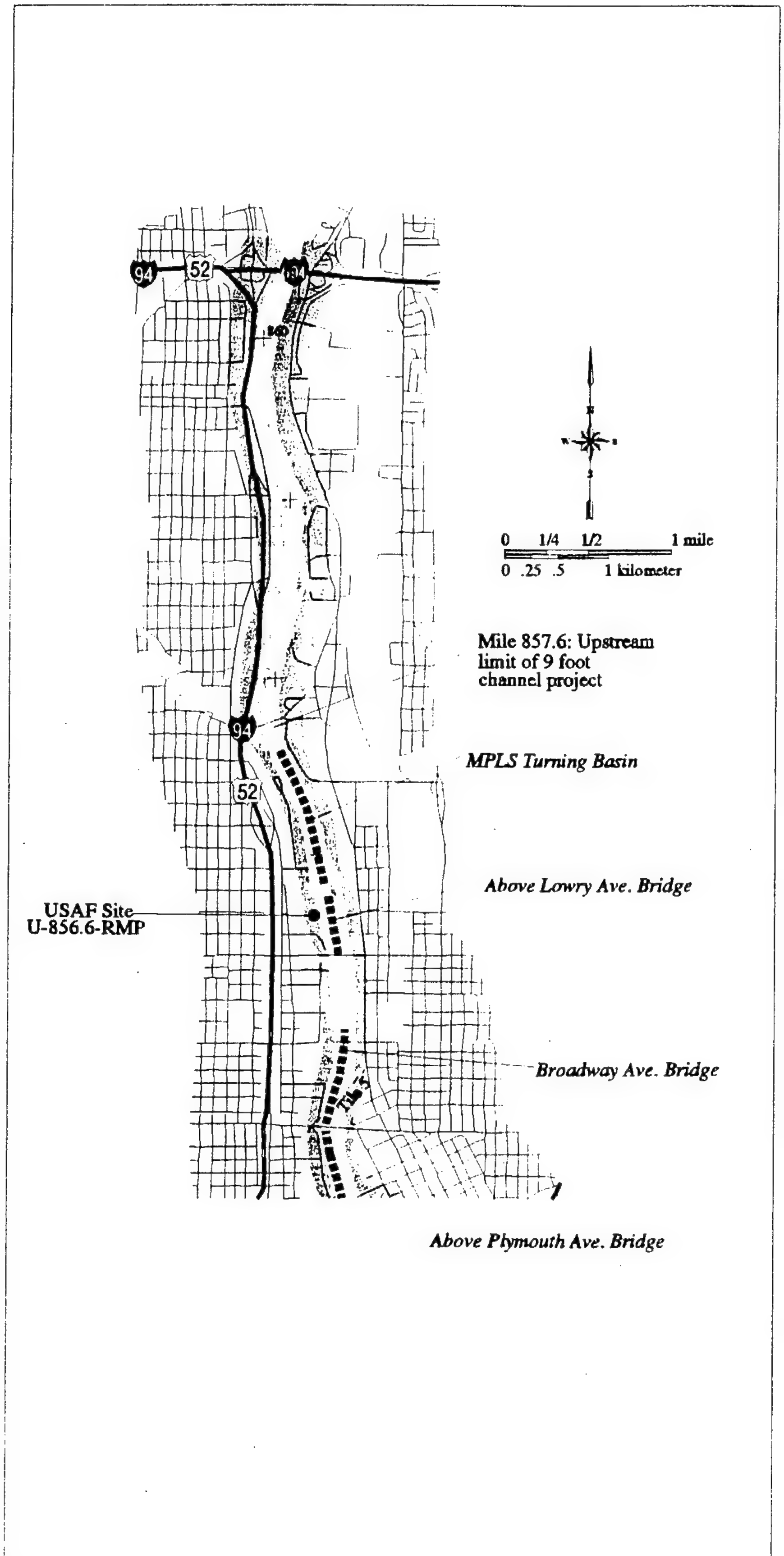
Tile 3



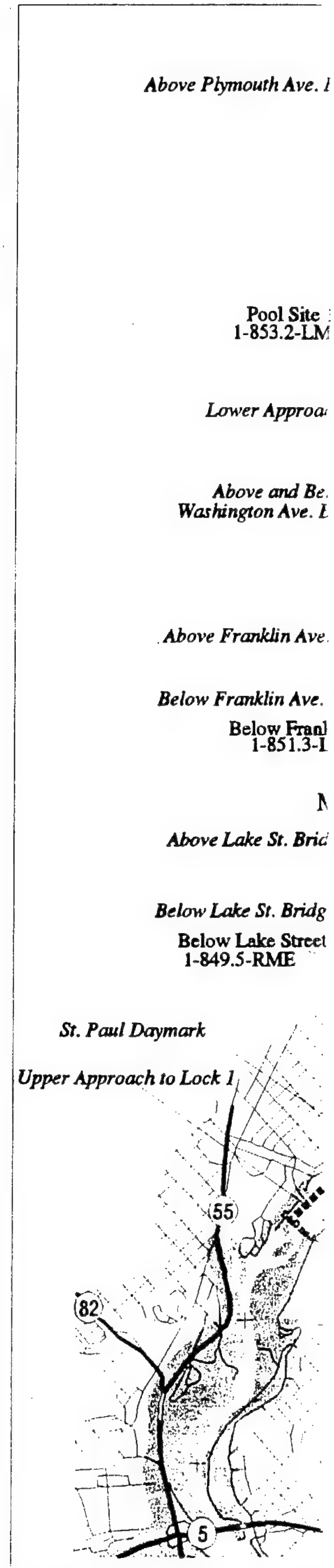


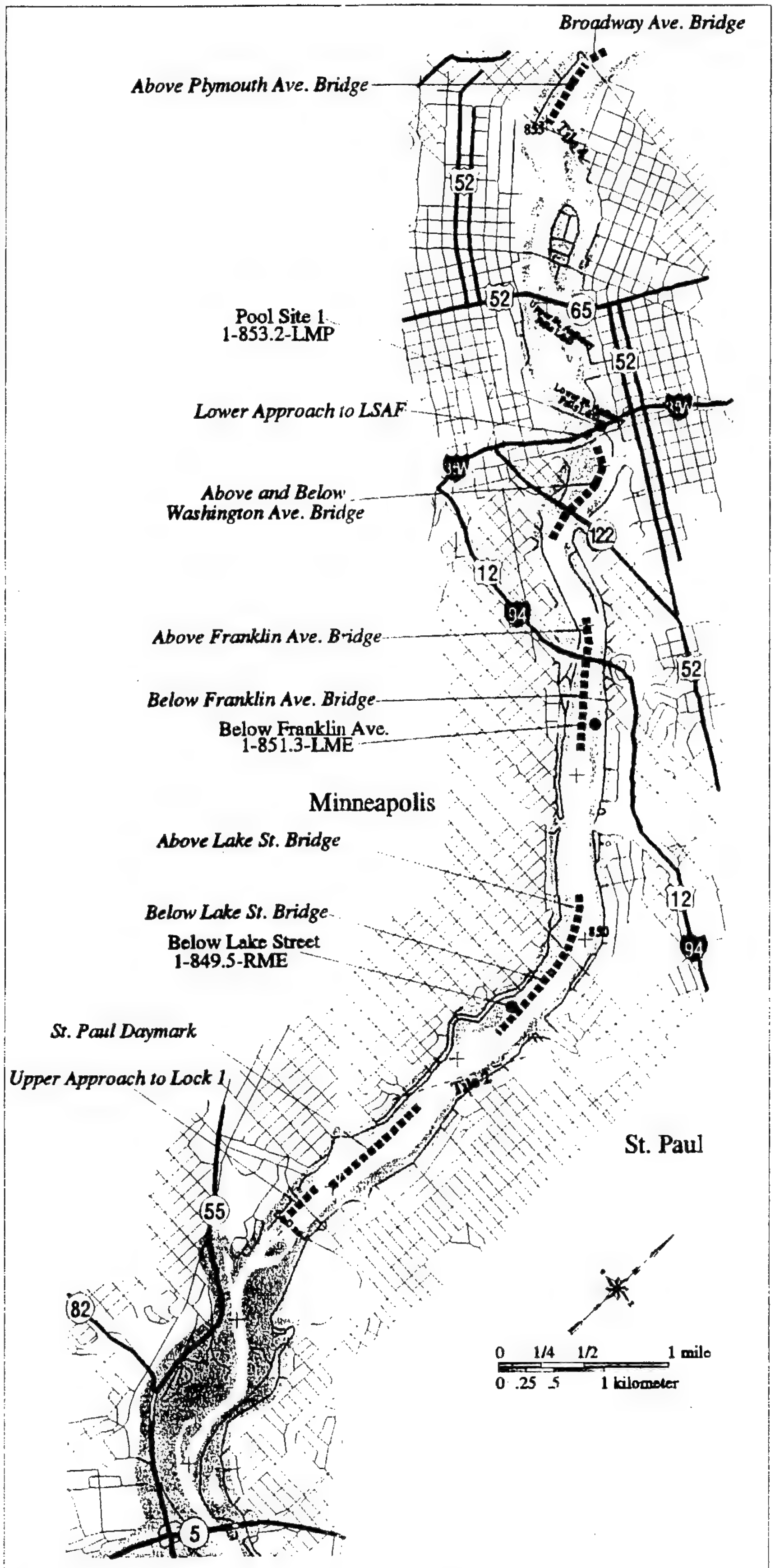
Tile 3

MN River: Mile 15 to 0 & St. Croix River: Mile 7 to 0

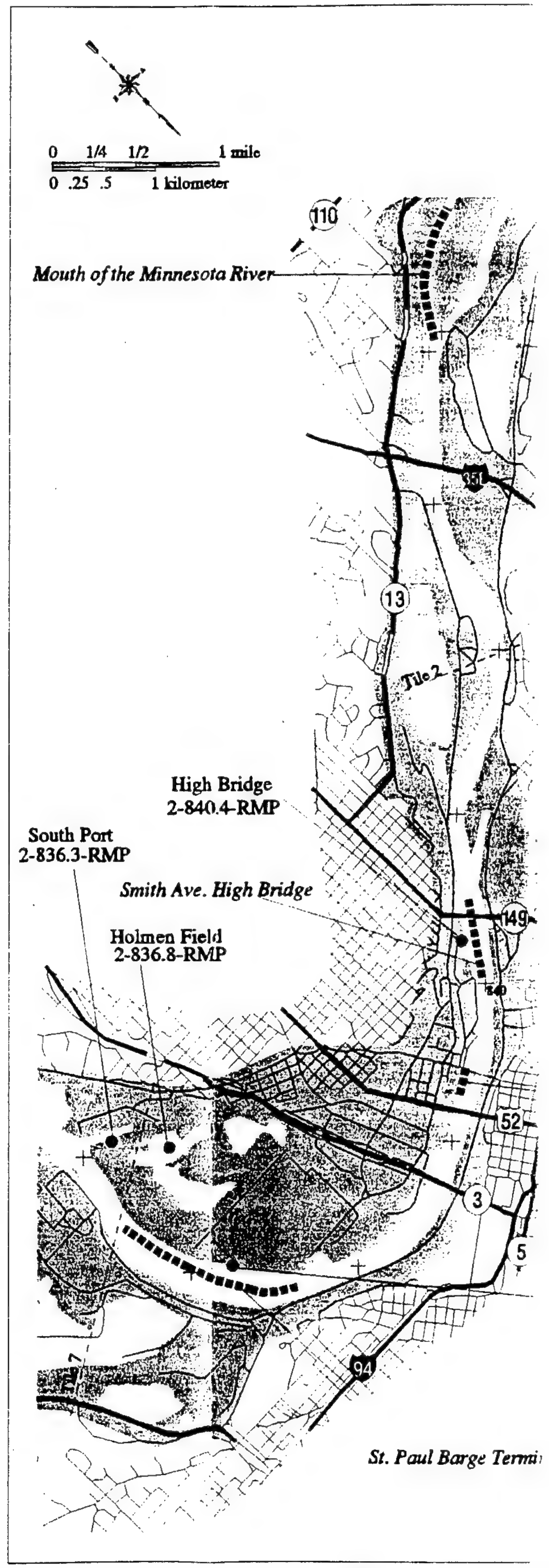

94
52
94
94
52
0 1/4 1/2 1 mile
0 .25 .5 1 kilometer
Mile 857.6: Upstream limit of 9 foot channel project
MPLS Turning Basin
Above Lowry Ave. Bridge
USAF Site
U-856.6-RMP
Broadway Ave. Bridge
Tile 5
Above Plymouth Ave. Bridge

Tile 4


St. Paul Daymark
Upper Approach to Lock 1
55
82
5

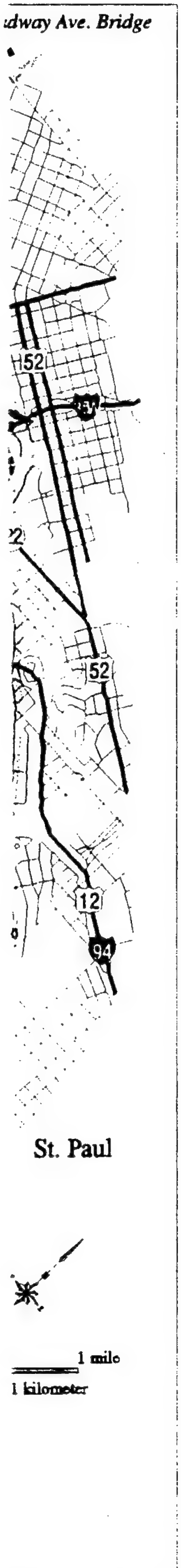


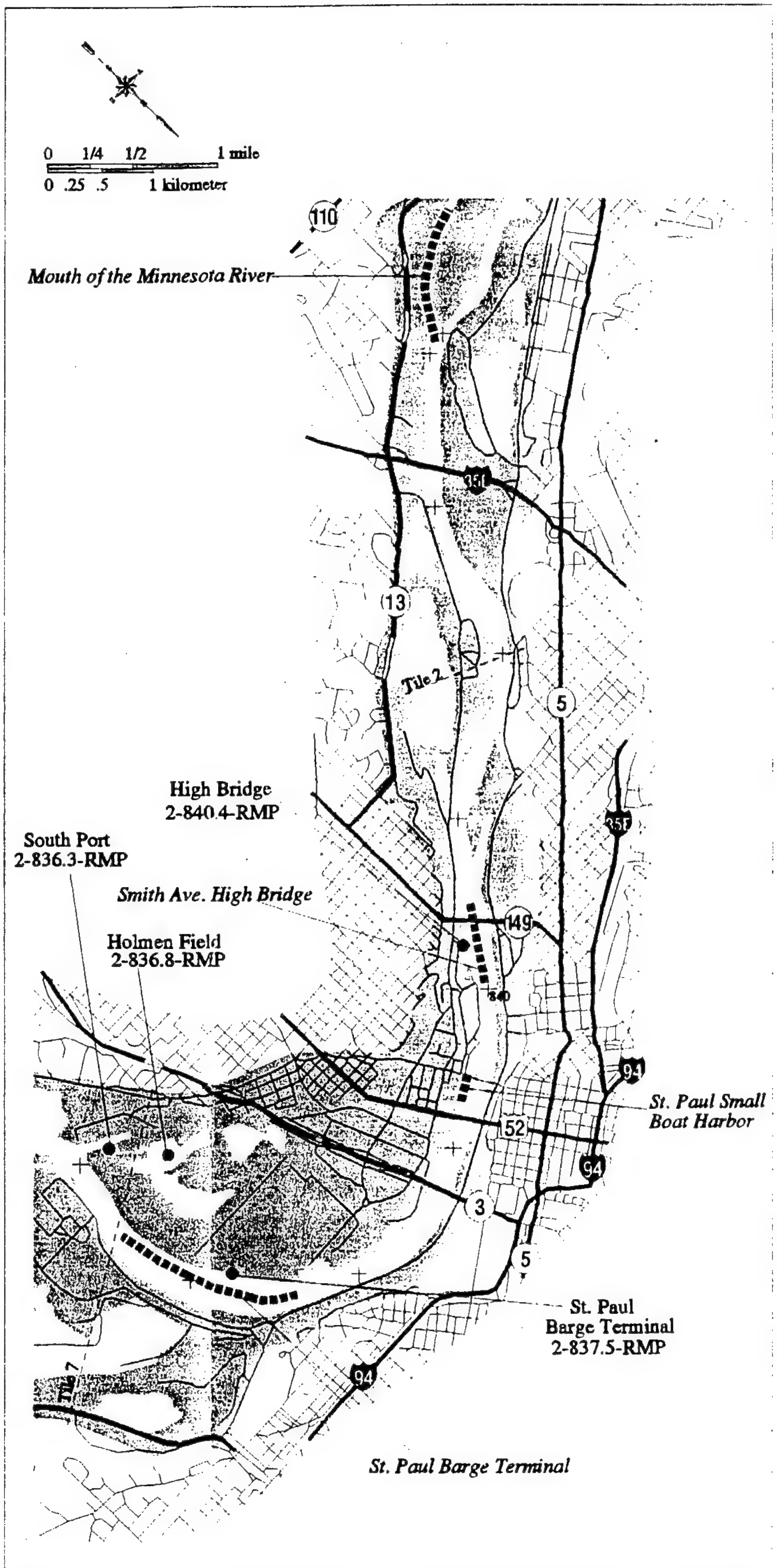
Tile 5



Tile 6

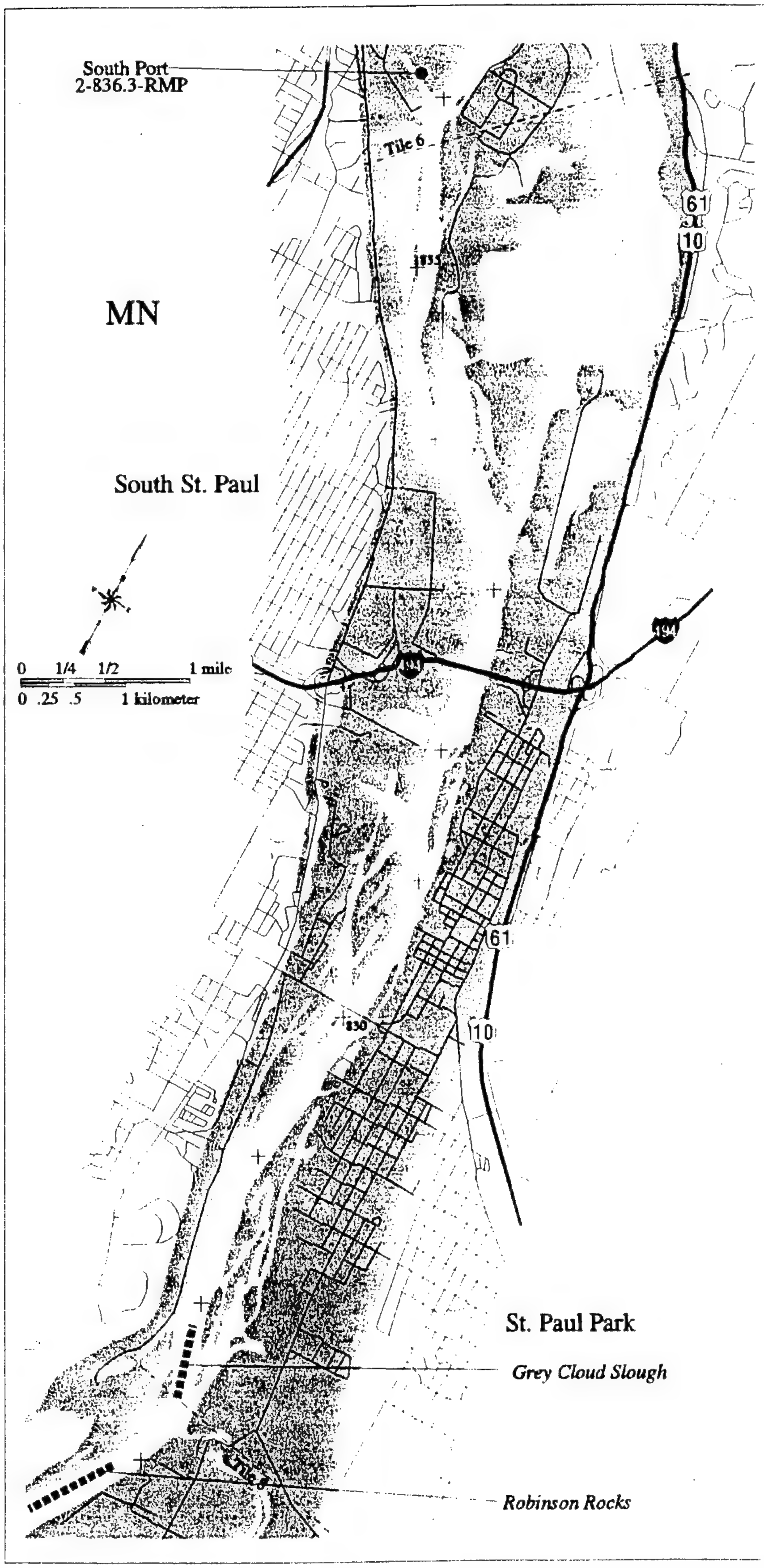
2





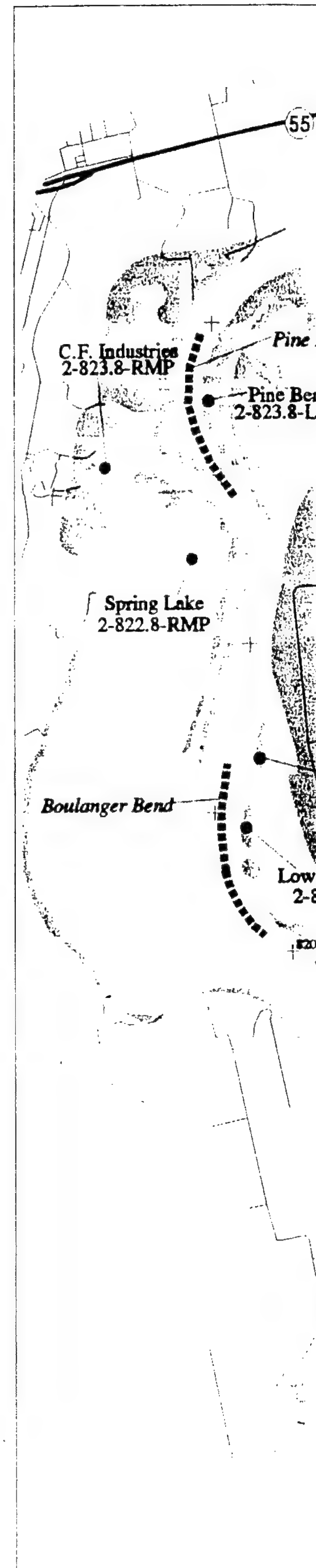
Tile 6

Pools USAF, 1, & 2: Mile 860 to 836



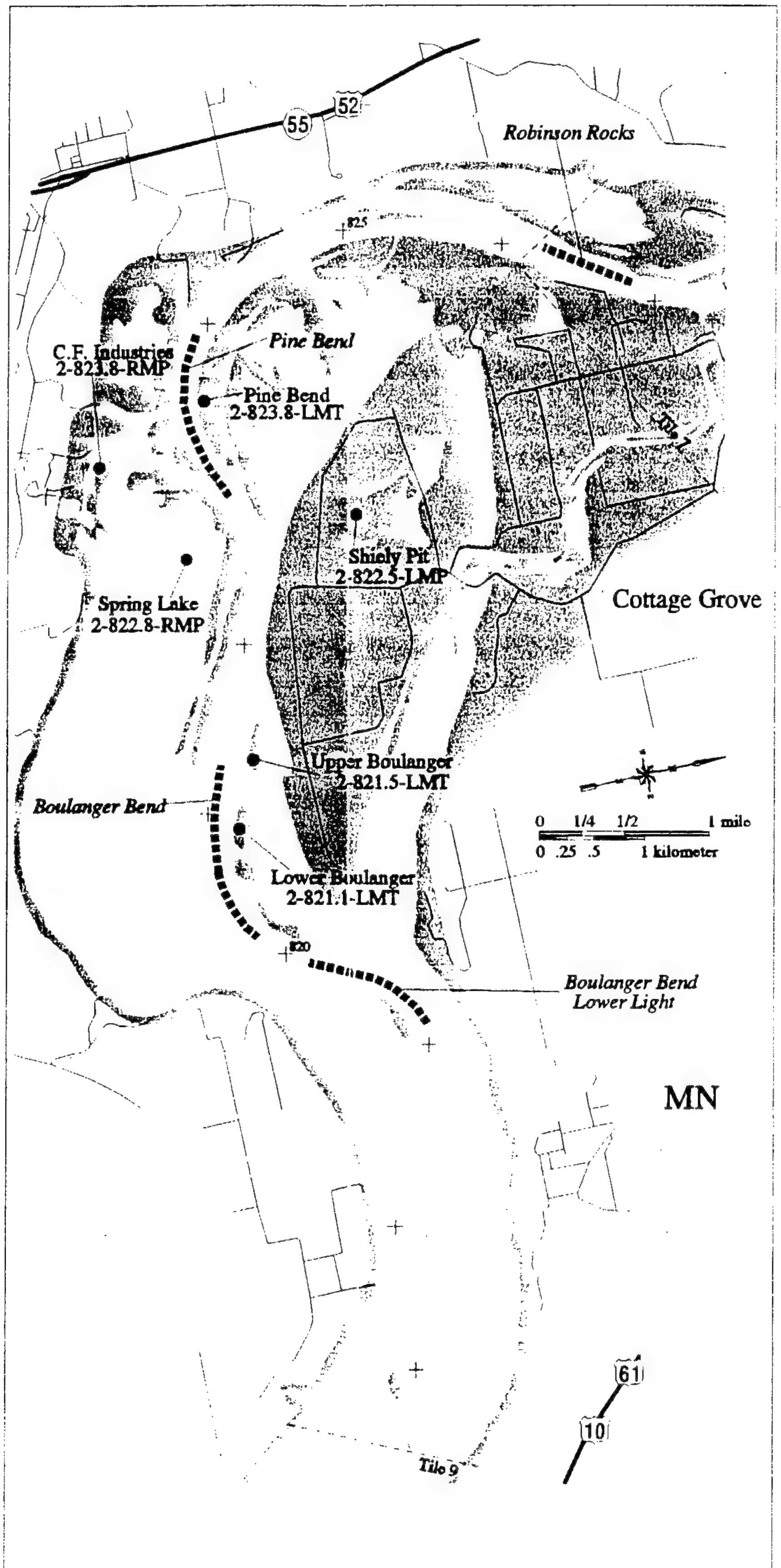
South Port
2-836.3-RMP
Tile 6
MN
South St. Paul
0 1/4 1/2 1 mile
0 .25 .5 1 kilometer
61
10
494
830
St. Paul Park
Grey Cloud Slough
Robinson Rocks

Tile 7

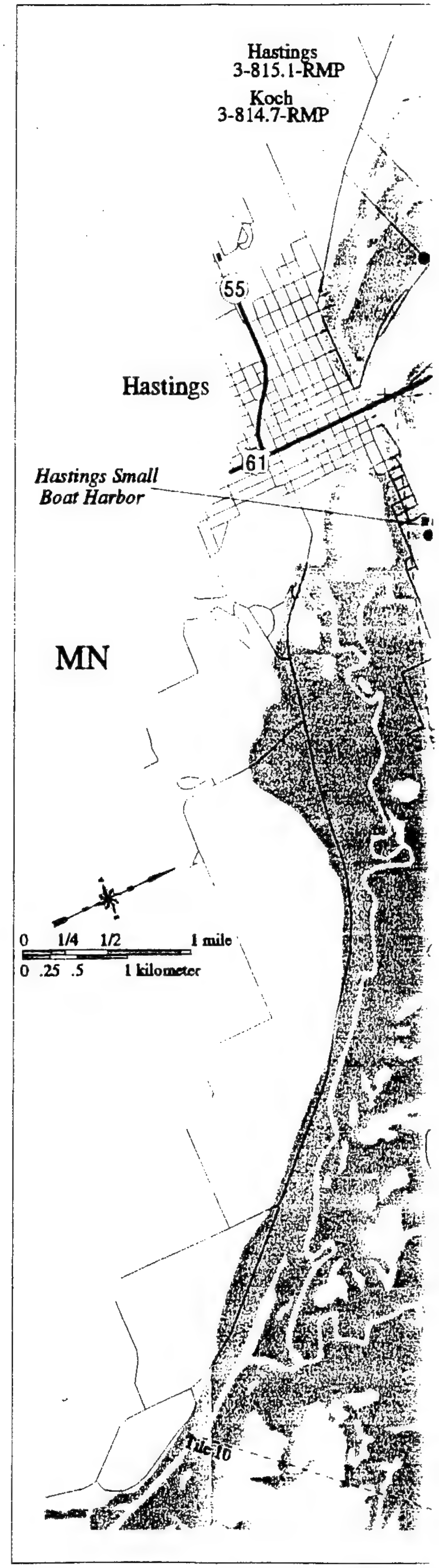


55
C.F. Industries
2-823.8-RMP
Spring Lake
2-822.8-RMP
Boulanger Bend

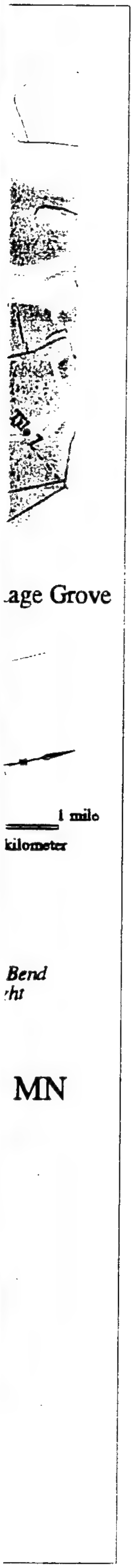
1

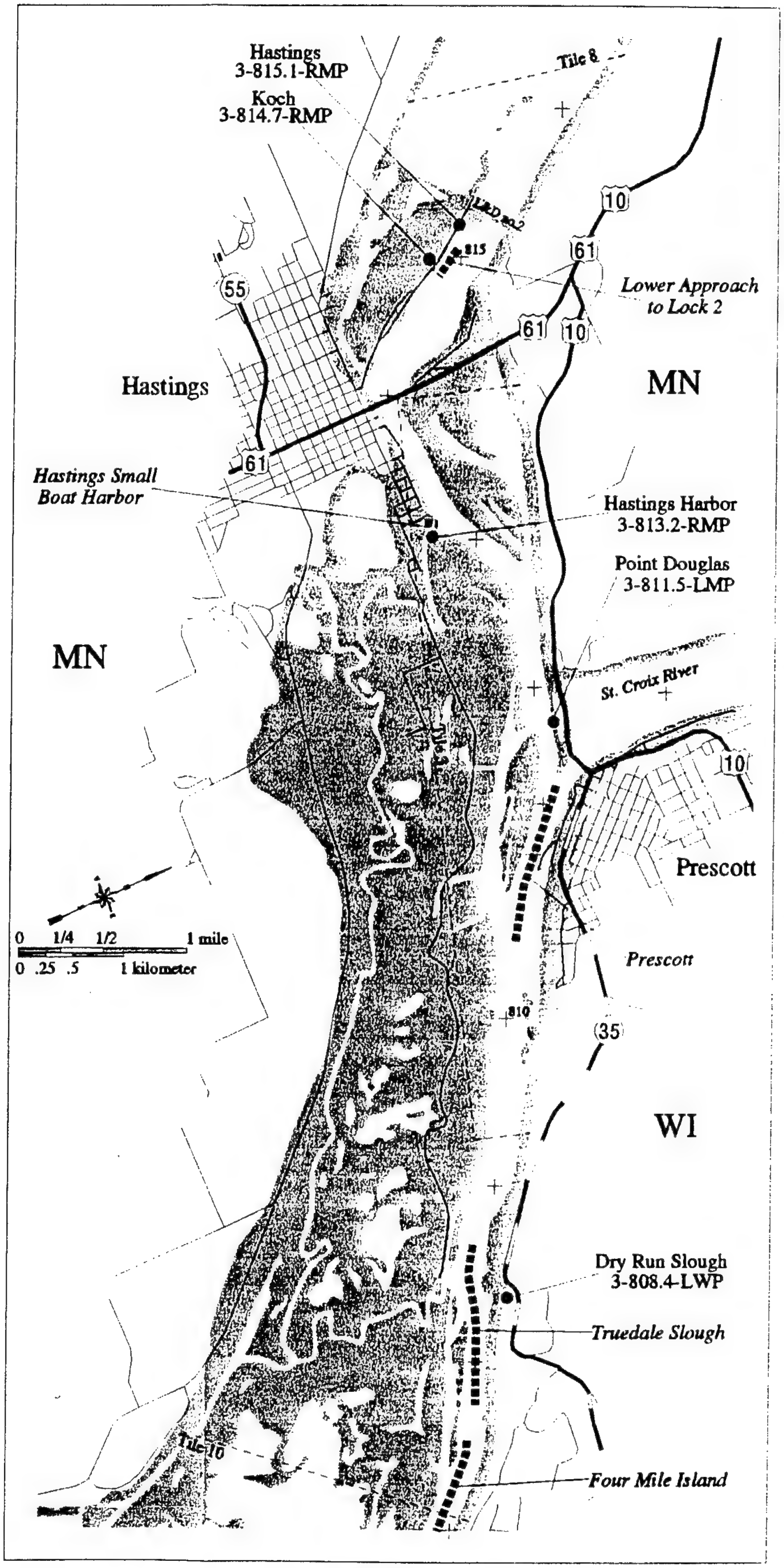

55
52
Robinson Rocks
825
C.F. Industries
2-823.8-RMP
Pine Bend
Pine Bend
2-823.8-LMT
Shiely Pit
2-822.5-LMP
Cottage Grove
Spring Lake
2-822.8-RMP
Upper Boulanger
2-821.5-LMT
Boulanger Bend
0 1/4 1/2 1 mile
0 .25 .5 1 kilometer
Lower Boulanger
2-821.1-LMT
820
Boulanger Bend
Lower Light
MN
61
10
Tile 9

Tile 8


Hastings
3-815.1-RMP
Koch
3-814.7-RMP
55
Hastings
61
Hastings Small
Boat Harbor
MN
0 1/4 1/2 1 mile
0 .25 .5 1 kilometer
Tile 10

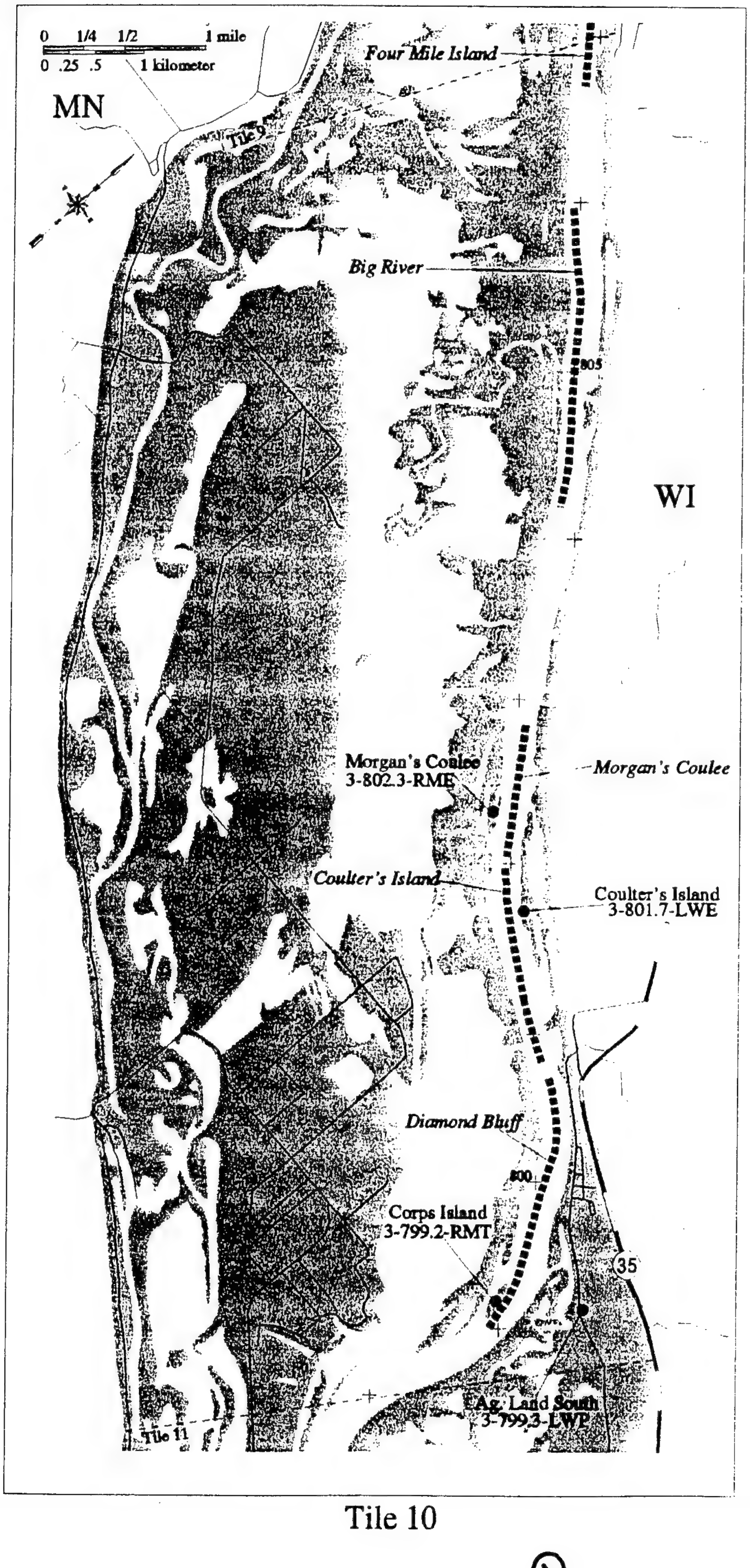
Tile 9



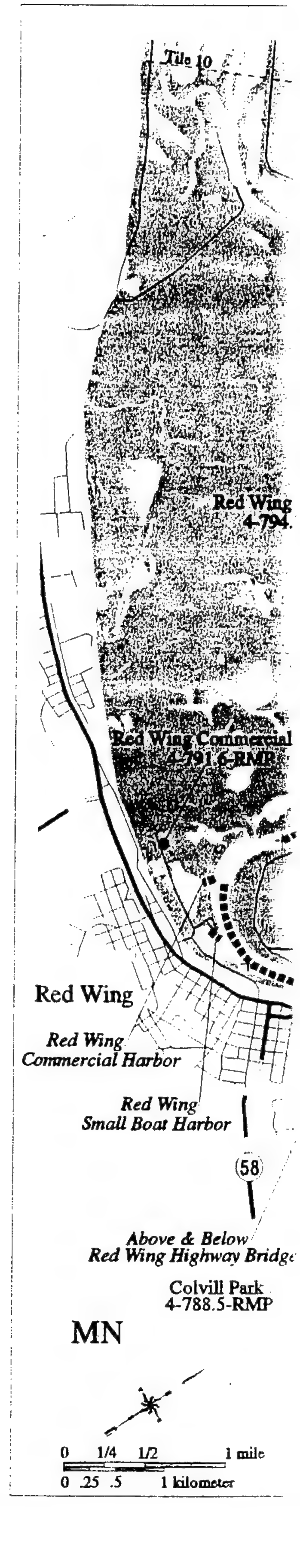


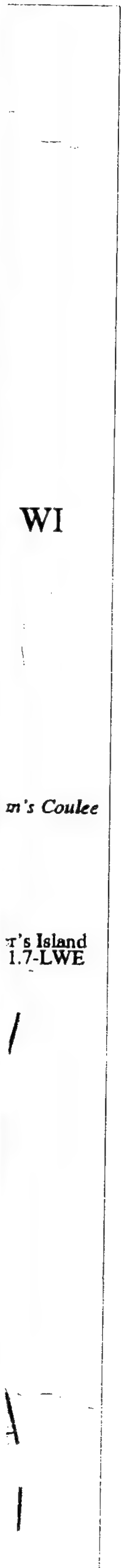
Tile 9

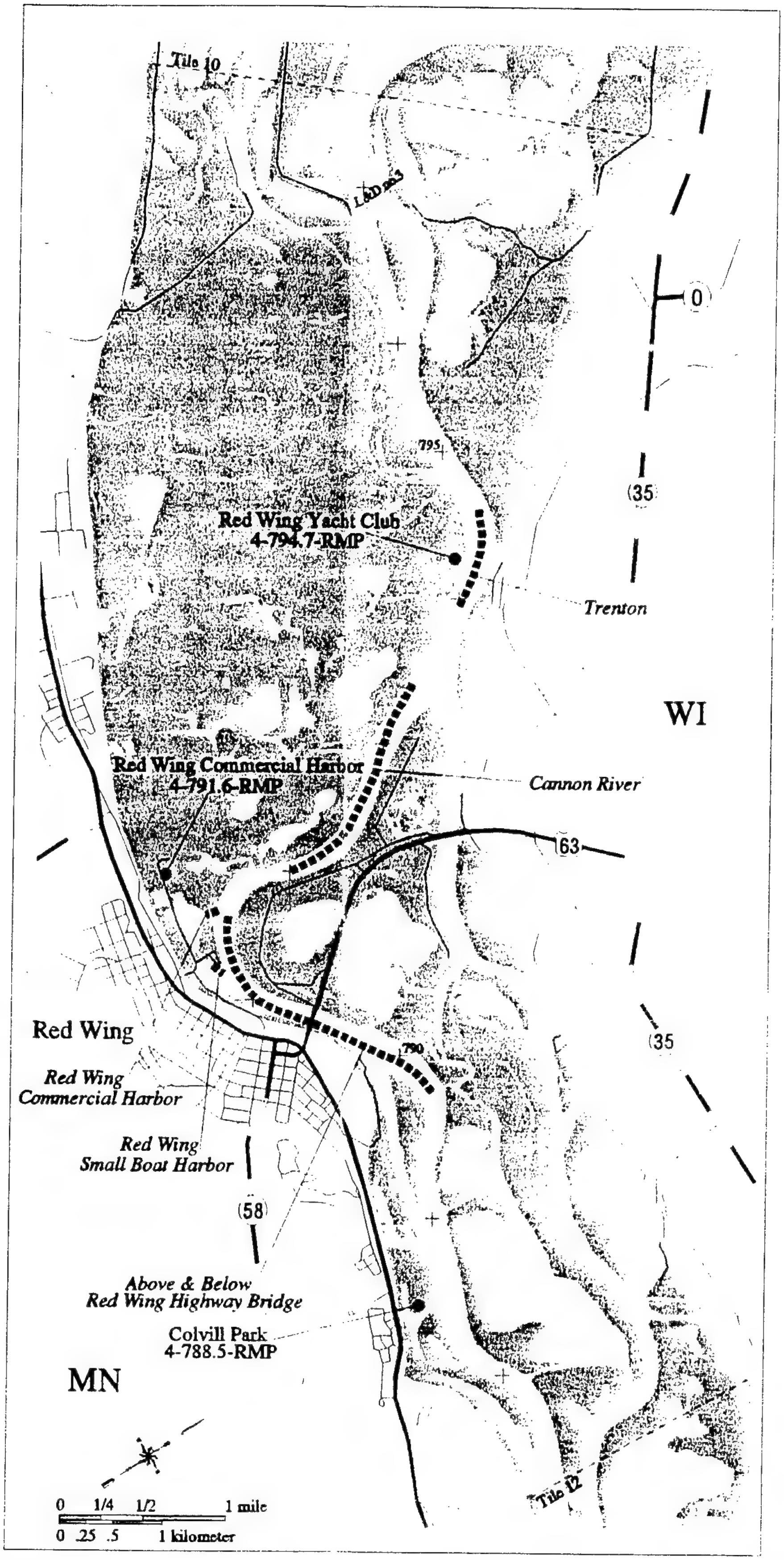
Pools 2 & 3: Mile 836 to 807


0 1/4 1/2 1 mile
0 .25 .5 1 kilometer
MN
Four Mile Island
Tile 9
Big River
805
WI
Morgan's Coulee
3-802.3-RME
Morgan's Coulee
Coulter's Island
Coulter's Island
3-801.7-LWE
Diamond Bluff
800
Corps Island
3-799.2-RMT
35
Ag. Land South
3-799.3-LWP
Tile 11

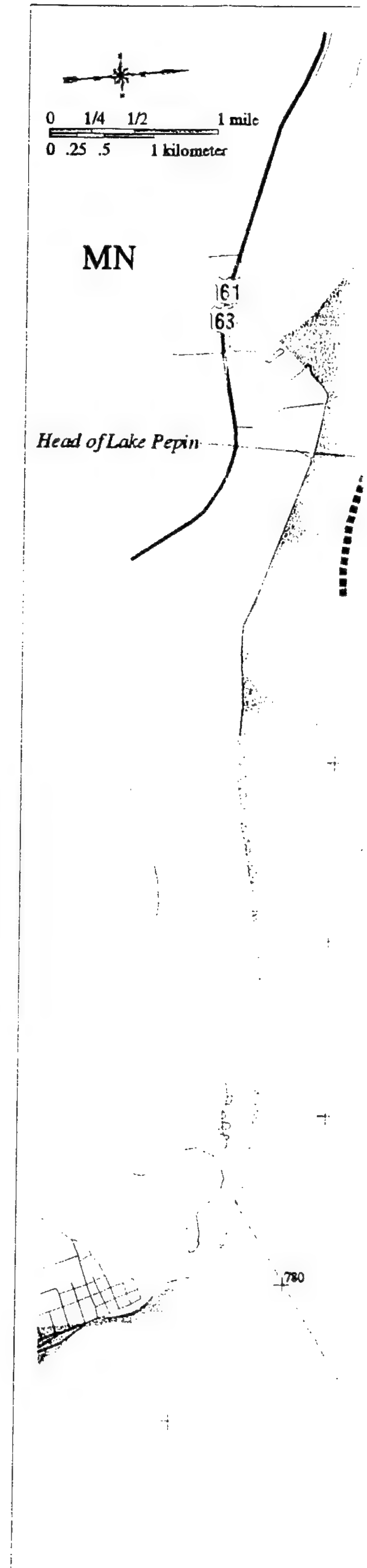
Tile 10


Tile 10
Red Wing
4-794.
Red Wing Commercial
4-791.6-RMP
Red Wing
Red Wing
Commercial Harbor
Red Wing
Small Boat Harbor
58
Above & Below
Red Wing Highway Bridge
Colvill Park
4-788.5-RMP
MN
0 1/4 1/2 1 mile
0 .25 .5 1 kilometer

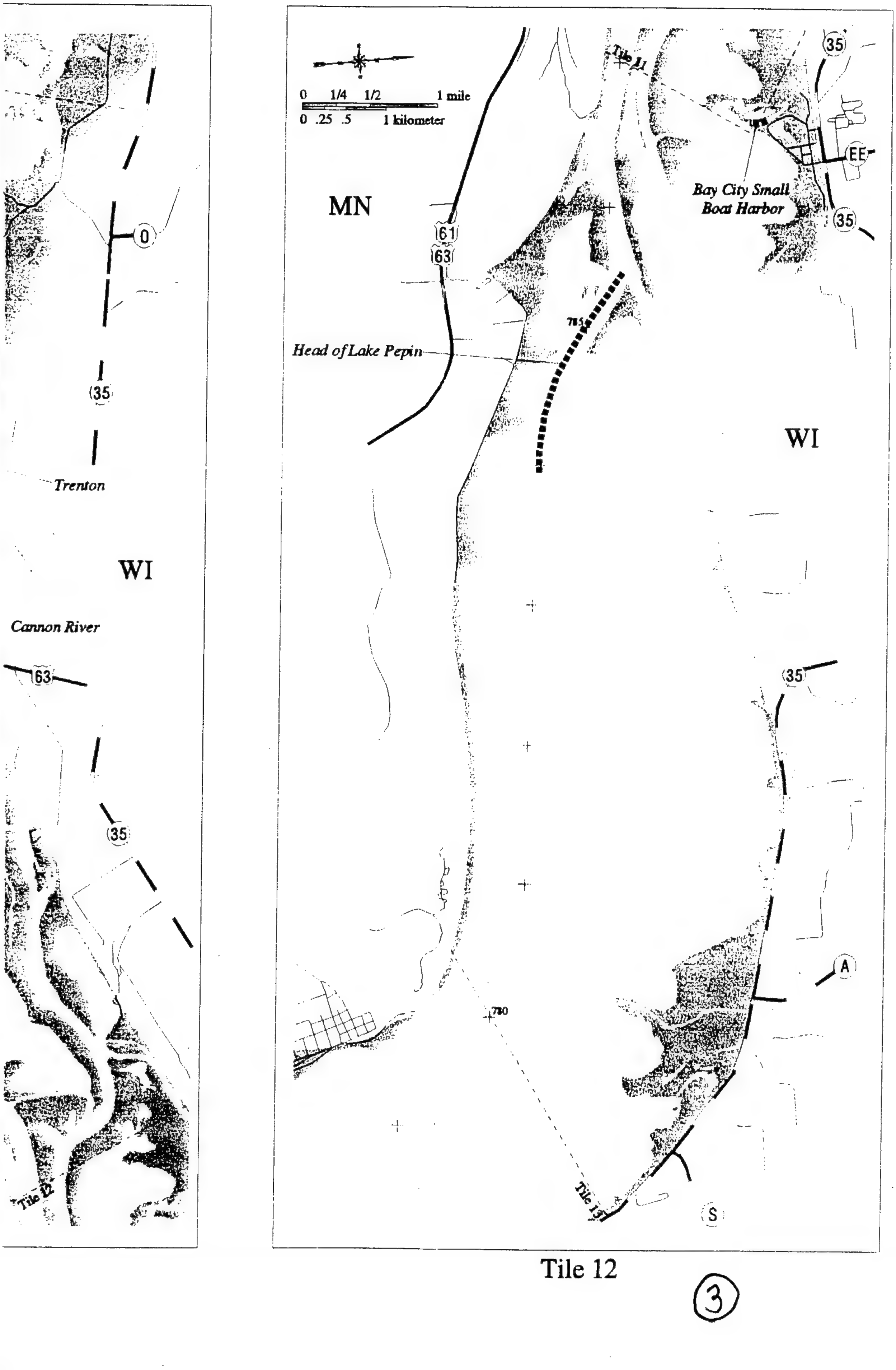

WI
m's Coulee
r's Island
1.7-LWE


Tile 10
L&D no.3
0
795
35
Red Wing Yacht Club
4-794.7-RMP
Trenton
WI
Red Wing Commercial Harbor
4-791.6-RMP
Cannon River
63
Red Wing
Red Wing
Commercial Harbor
790
35
Red Wing
Small Boat Harbor
58
Above & Below
Red Wing Highway Bridge
Colvill Park
4-788.5-RMP
MN
0 1/4 1/2 1 mile
0 .25 .5 1 kilometer
Tile 12

Tile 11

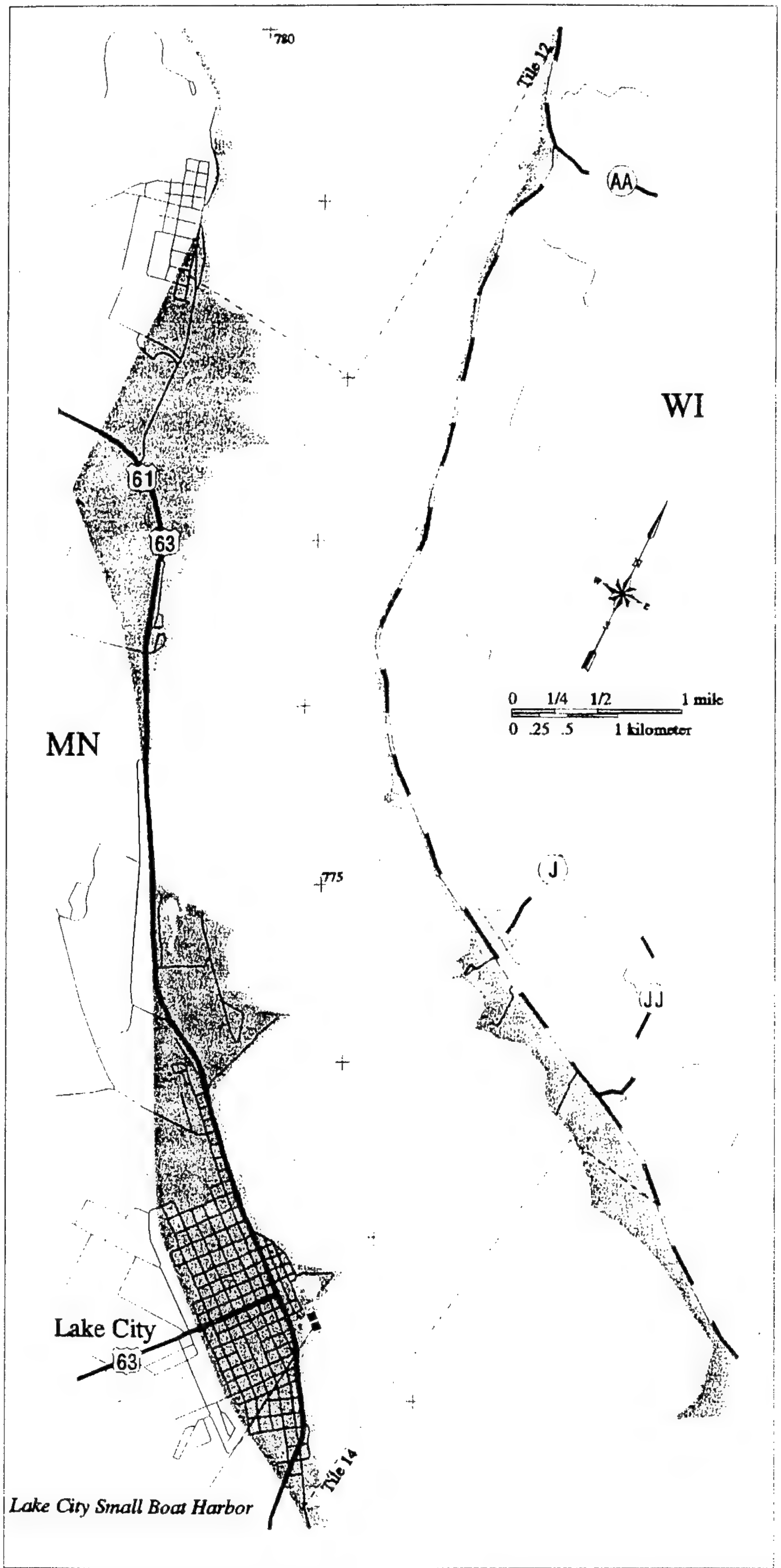

0 1/4 1/2 1 mile
0 .25 .5 1 kilometer
MN
61
63
Head of Lake Pepin
780

T

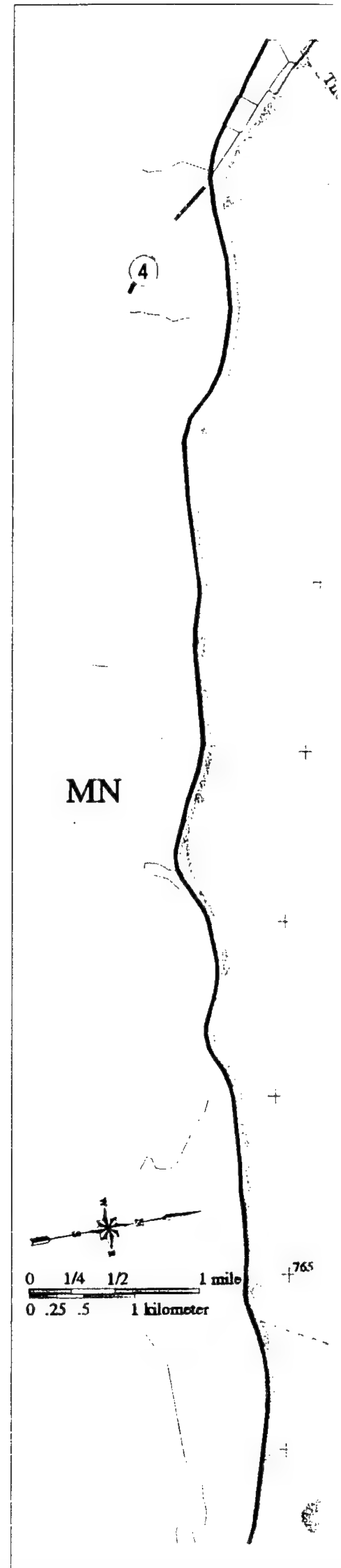


Tile 12

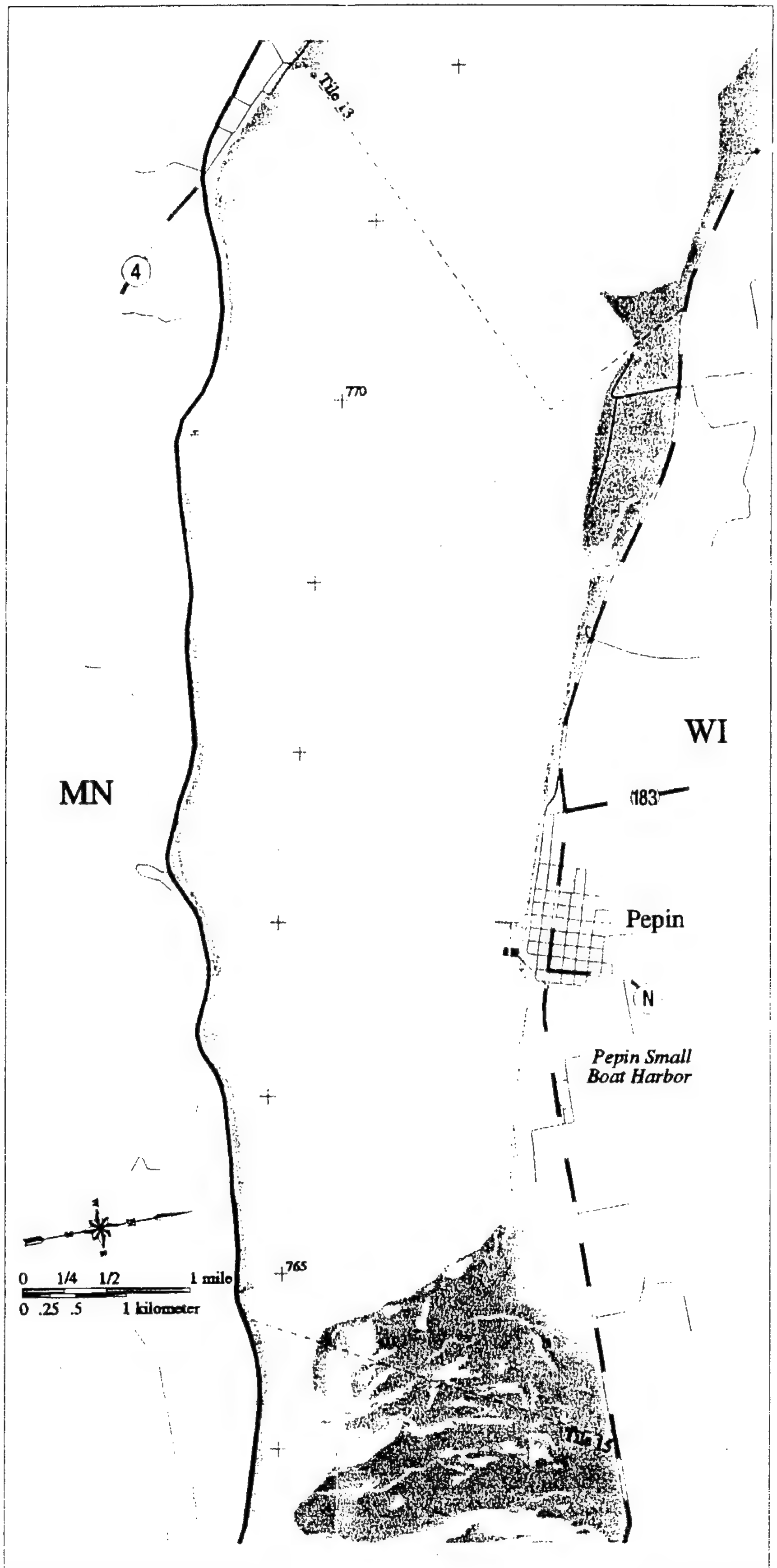
Pools 3 & 4: Mile 807 to 779


780
Tile 12
AA
WI
61
63
0 1/4 1/2 1 mile
0 .25 .5 1 kilometer
MN
775
J
JJ
Lake City
63
Tile 14
Lake City Small Boat Harbor

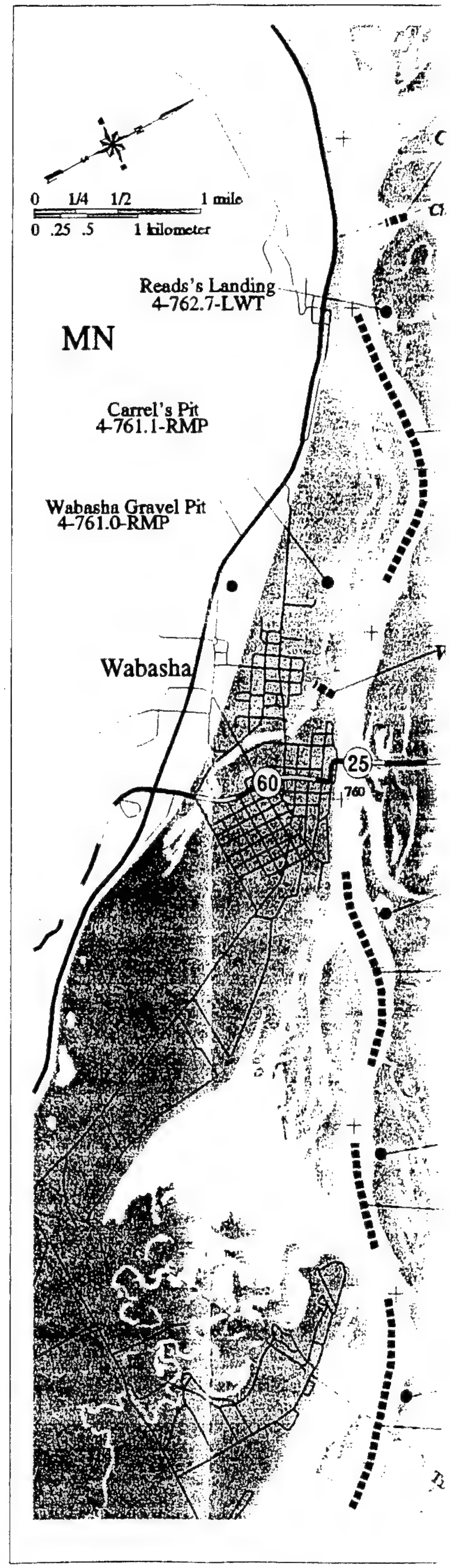
Tile 13


4
MN
0 1/4 1/2 1 mile
0 .25 .5 1 kilometer
765

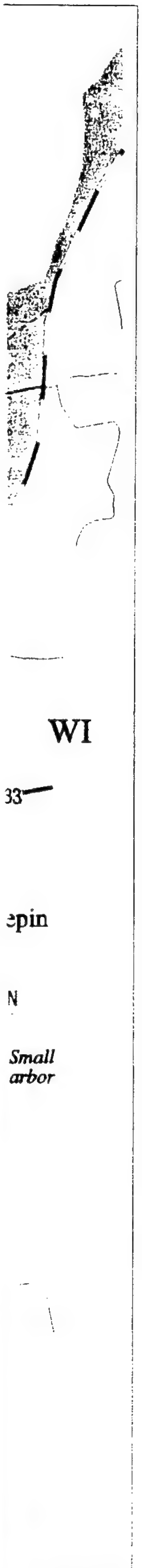
①

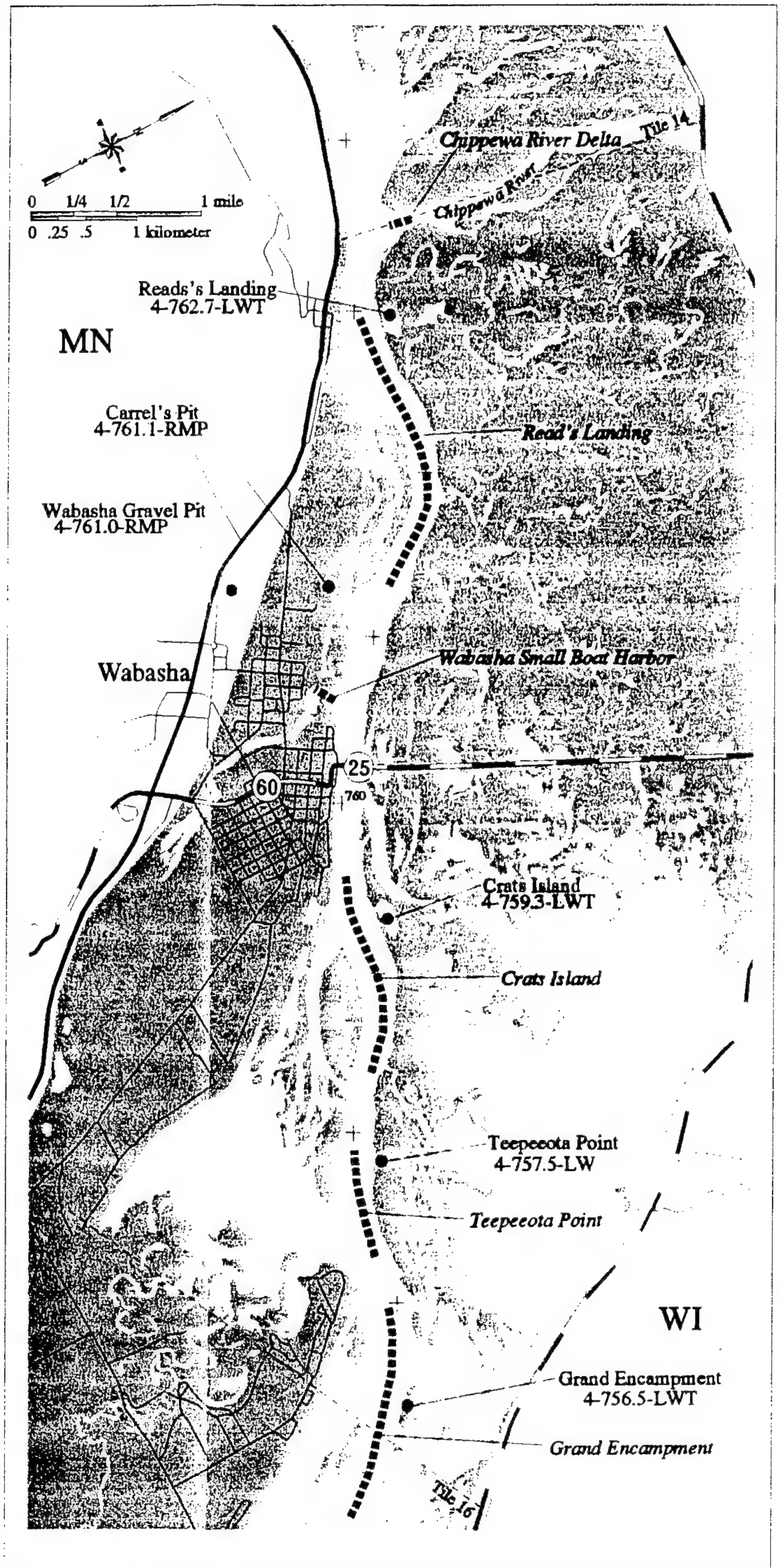


Tile 14



Tile 15

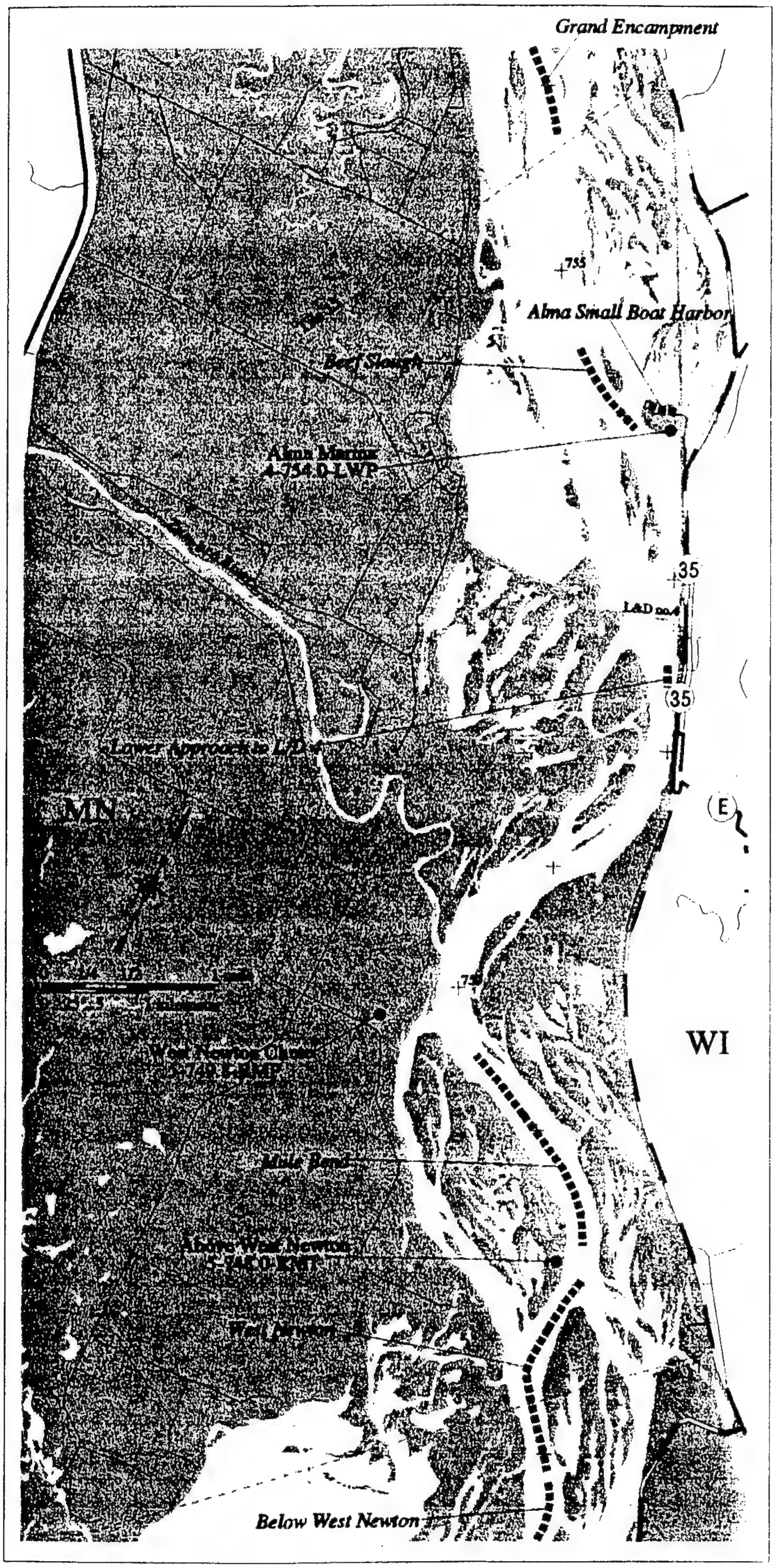




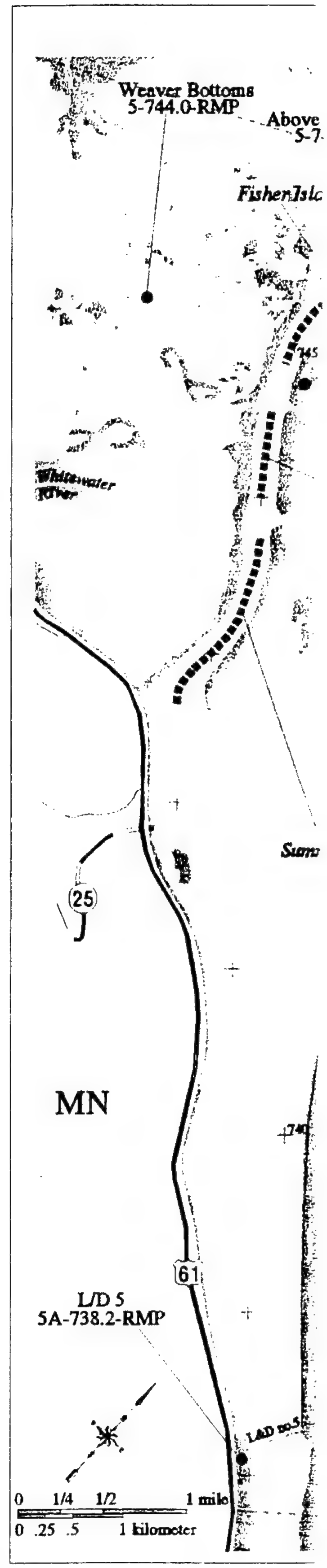
Tile 15

Pool 4: Mile 779 to 756

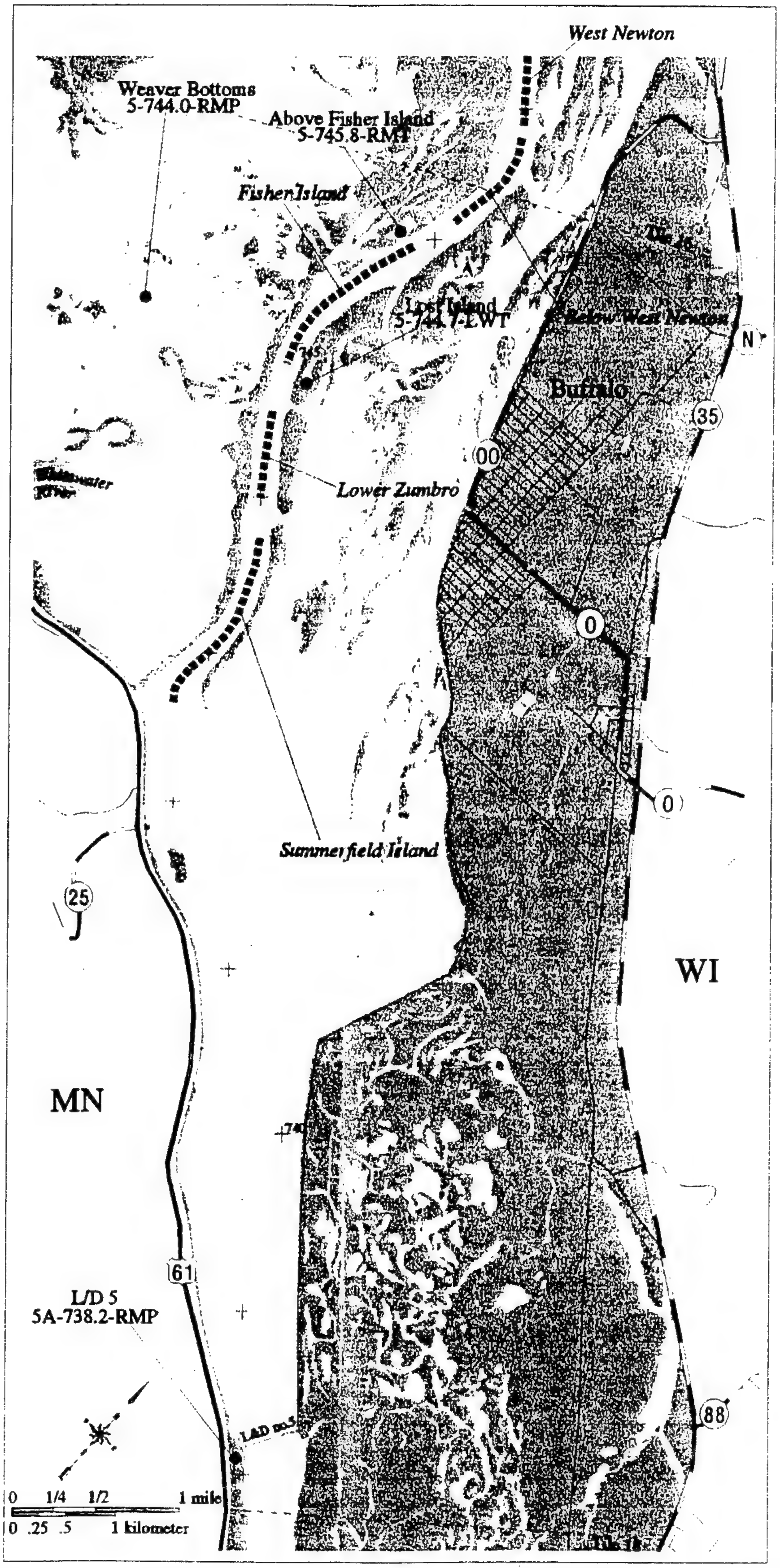
3


Grand Encampment
755
Alma Small Boat Harbor
Beef Slough
Alma Marina
4-754.0-LWP
35
L&D no.4
35
E
MN
WI
750
Mule Bend
West Newton
Below West Newton

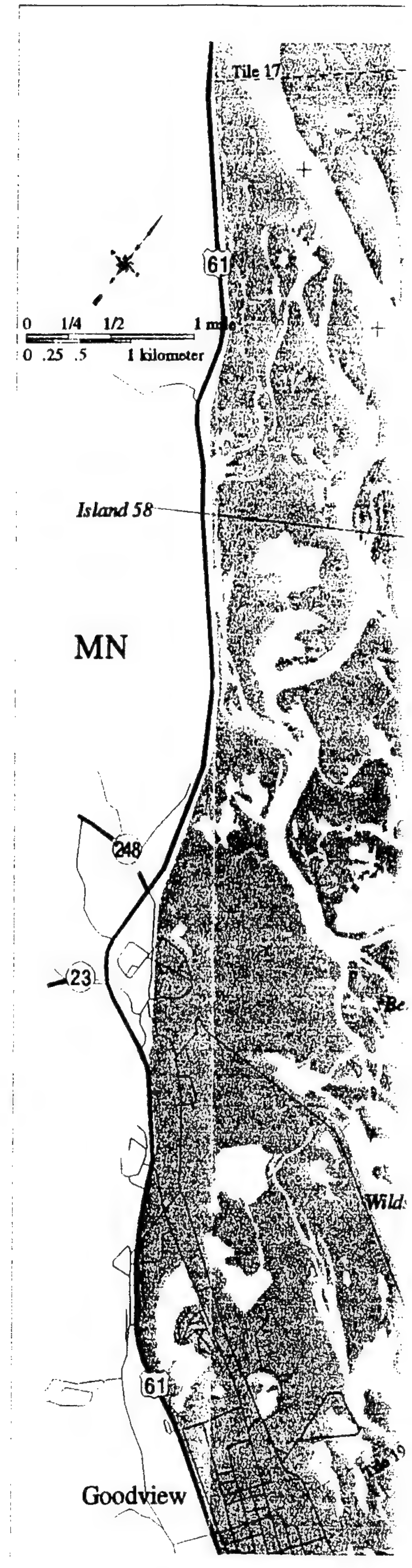
Tile 16


Weaver Bottoms
5-744.0-RMP
Above
745
Whitewater
River
25
MN
740
61
L/D 5
5A-738.2-RMP
L&D no.5
0 1/4 1/2 1 mile
0 .25 .5 1 kilometer

1

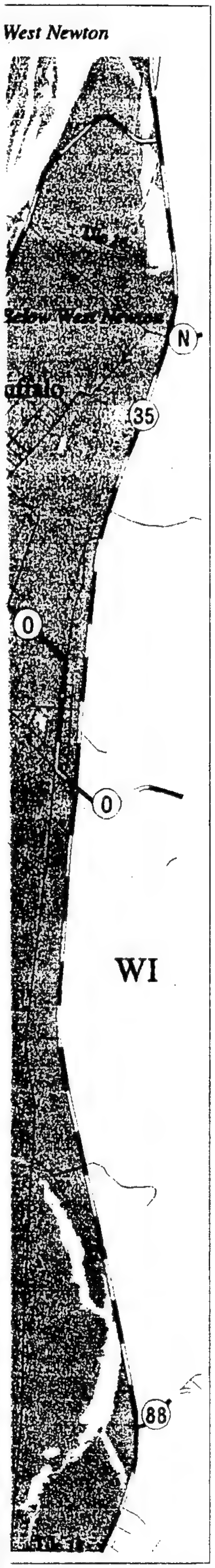


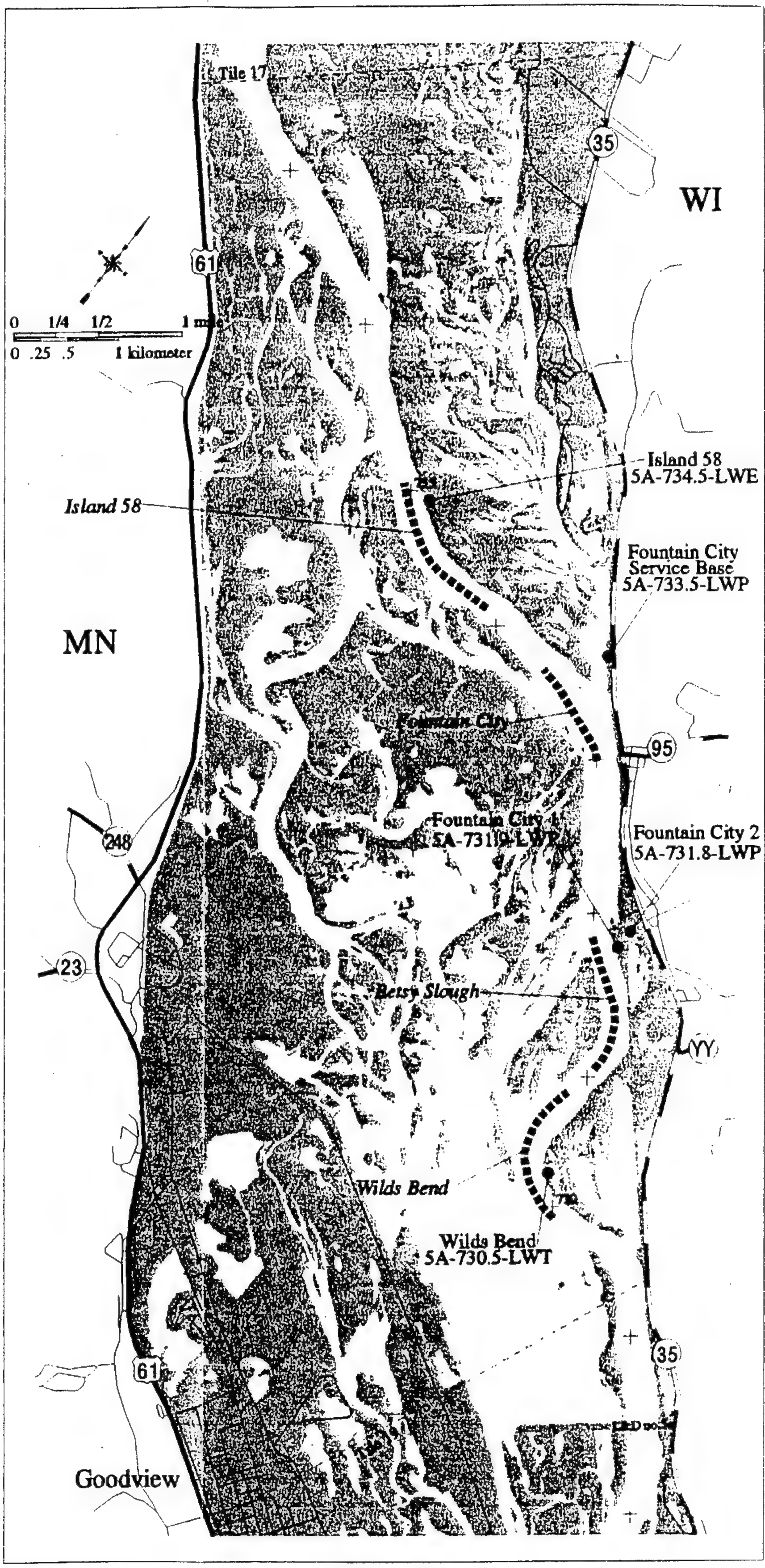
Tile 17



Tile

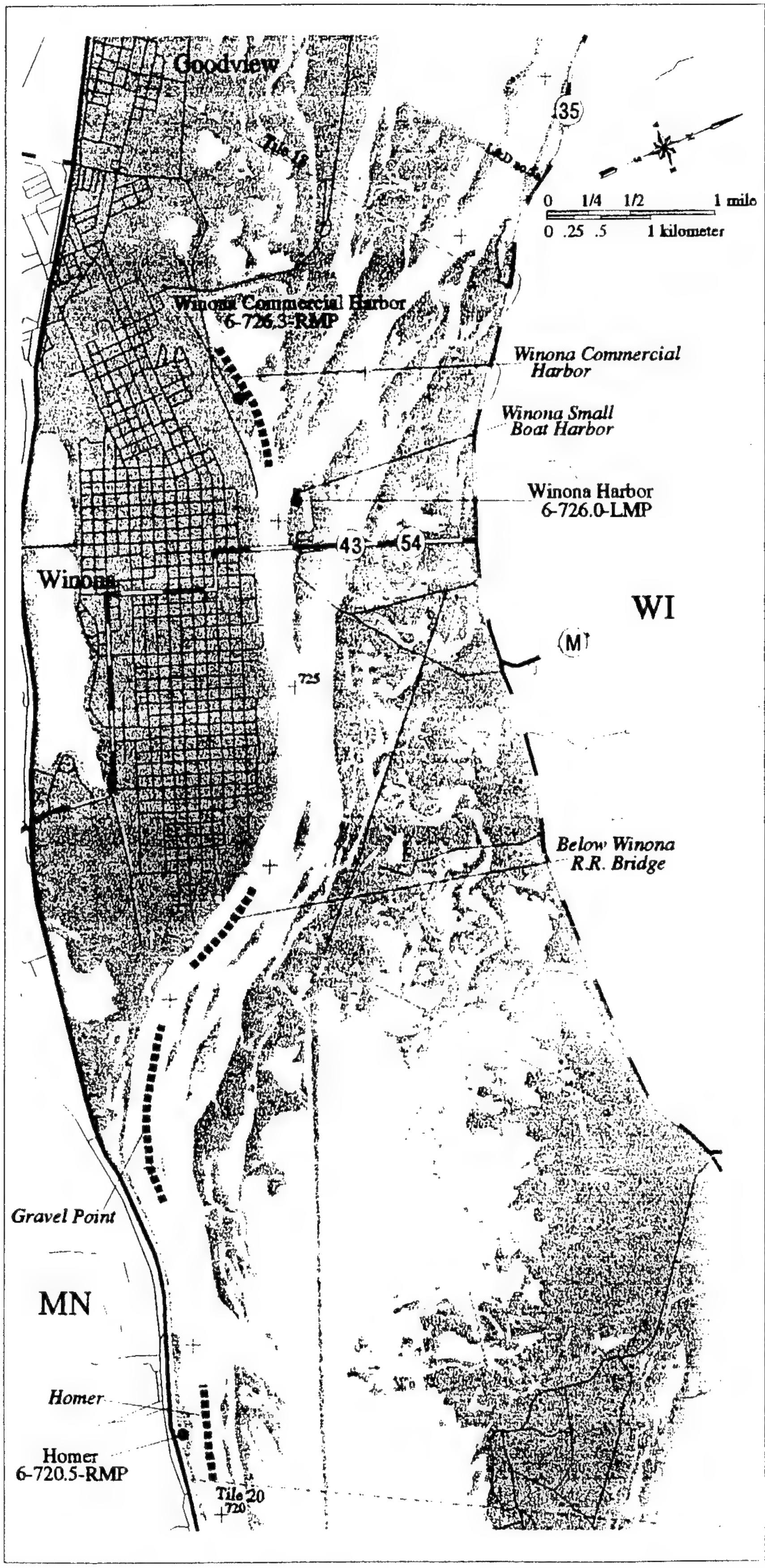
2


West Newton
N
35
0
0
WI
88

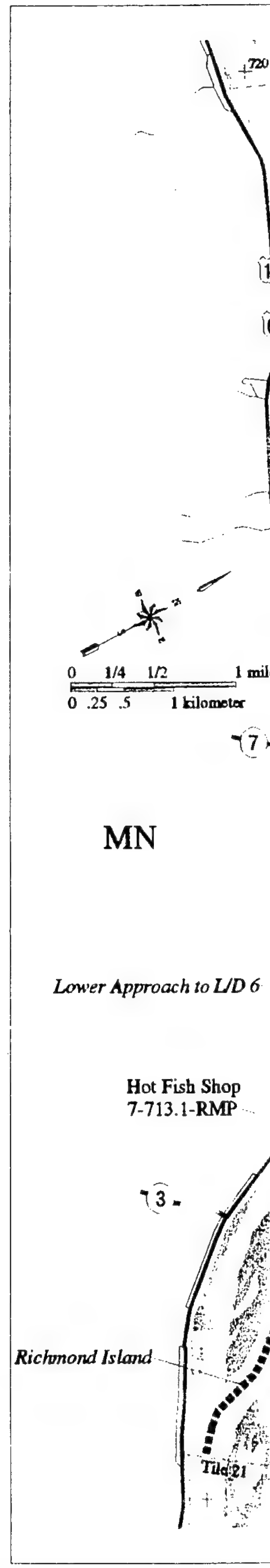

Tile 17
35
WI
61
0 1/4 1/2 1 mile
0 .25 .5 1 kilometer
MN
Island 58
Island 58
5A-734.5-LWE
Fountain City
Service Base
5A-733.5-LWP
Fountain City
95
Fountain City 1
Fountain City 2
5A-731.8-LWP
248
23
Betsy Slough
YY
Wilds Bend
Wilds Bend
5A-730.5-LWT
35
61
Goodview

Tile 18

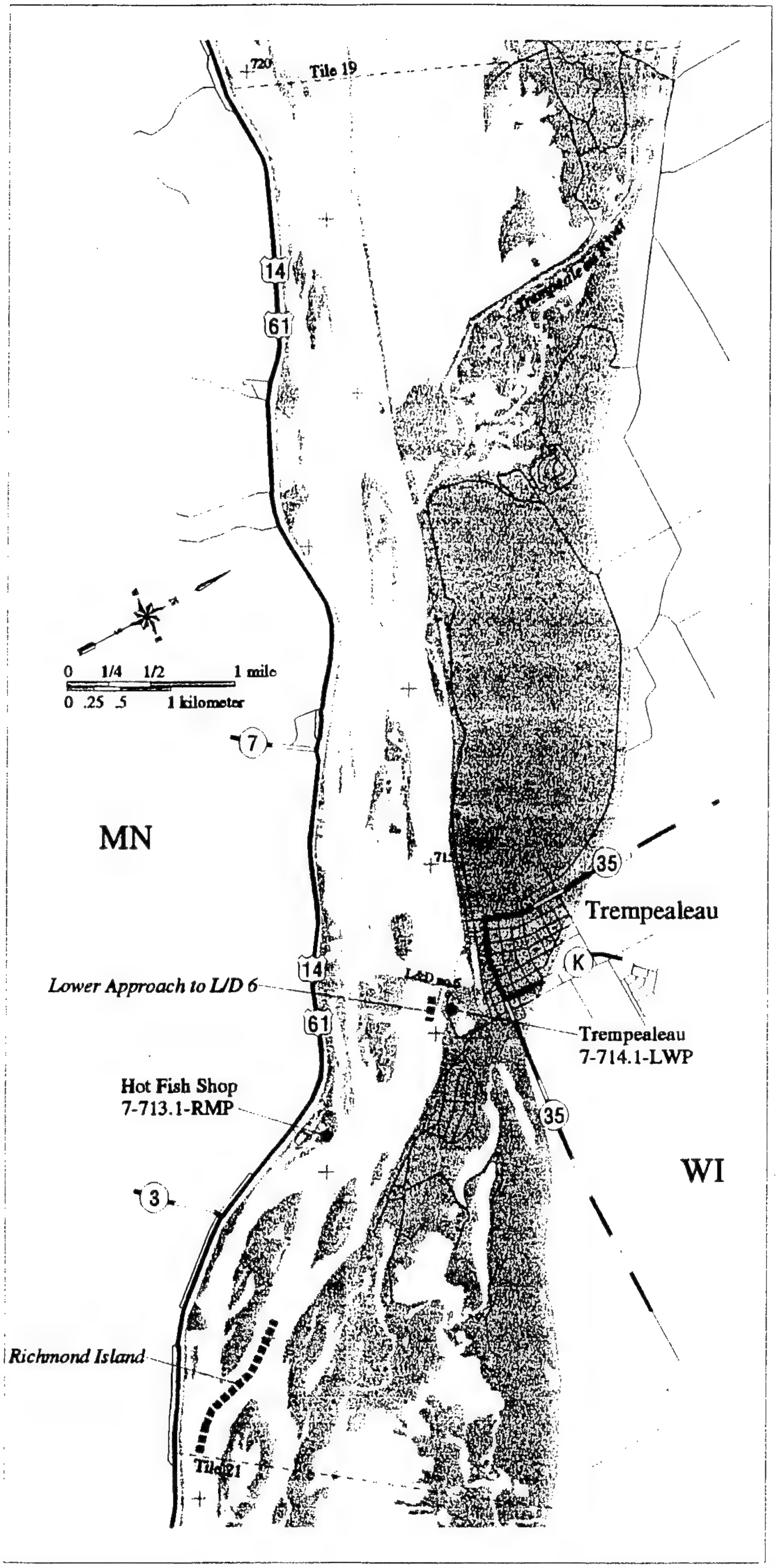
3


Goodview
Tile 18
35
L/D 6
0 1/4 1/2 1 mile
0 .25 .5 1 kilometer
Winona Commercial Harbor
6-726.3-RMP
Winona Commercial Harbor
Winona Small Boat Harbor
Winona Harbor
6-726.0-LMP
43
54
Winona
WI
M
725
Below Winona R.R. Bridge
Gravel Point
MN
Homer
Homer
6-720.5-RMP
Tile 20
720

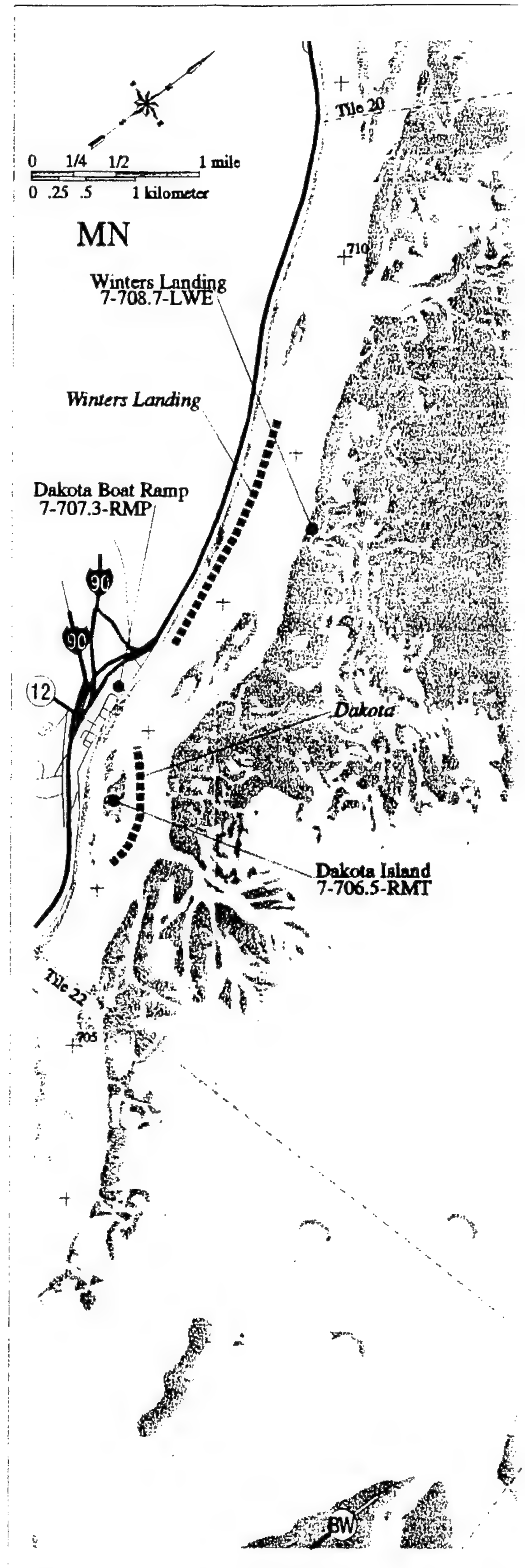
Tile 19


720
14
61
0 1/4 1/2 1 mile
0 .25 .5 1 kilometer
7
MN
Lower Approach to L/D 6
Hot Fish Shop
7-713.1-RMP
3
Richmond Island
Tile 21

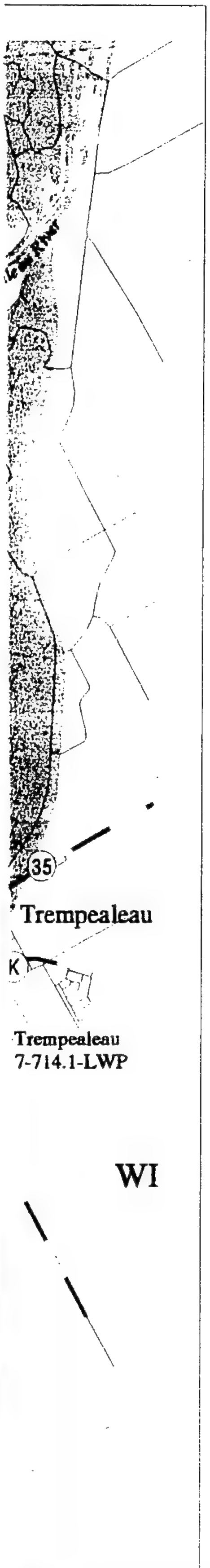
1

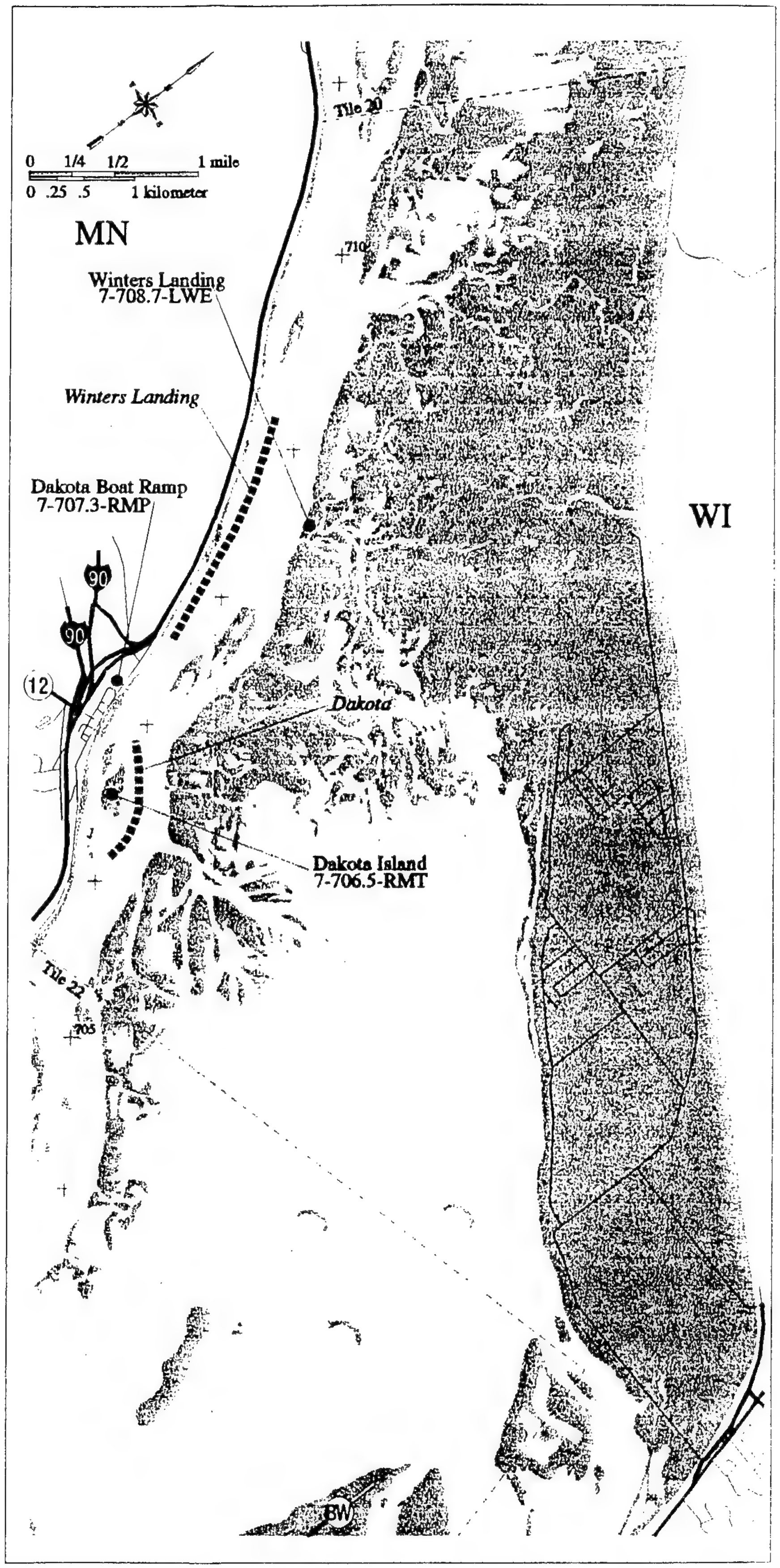


Tile 20



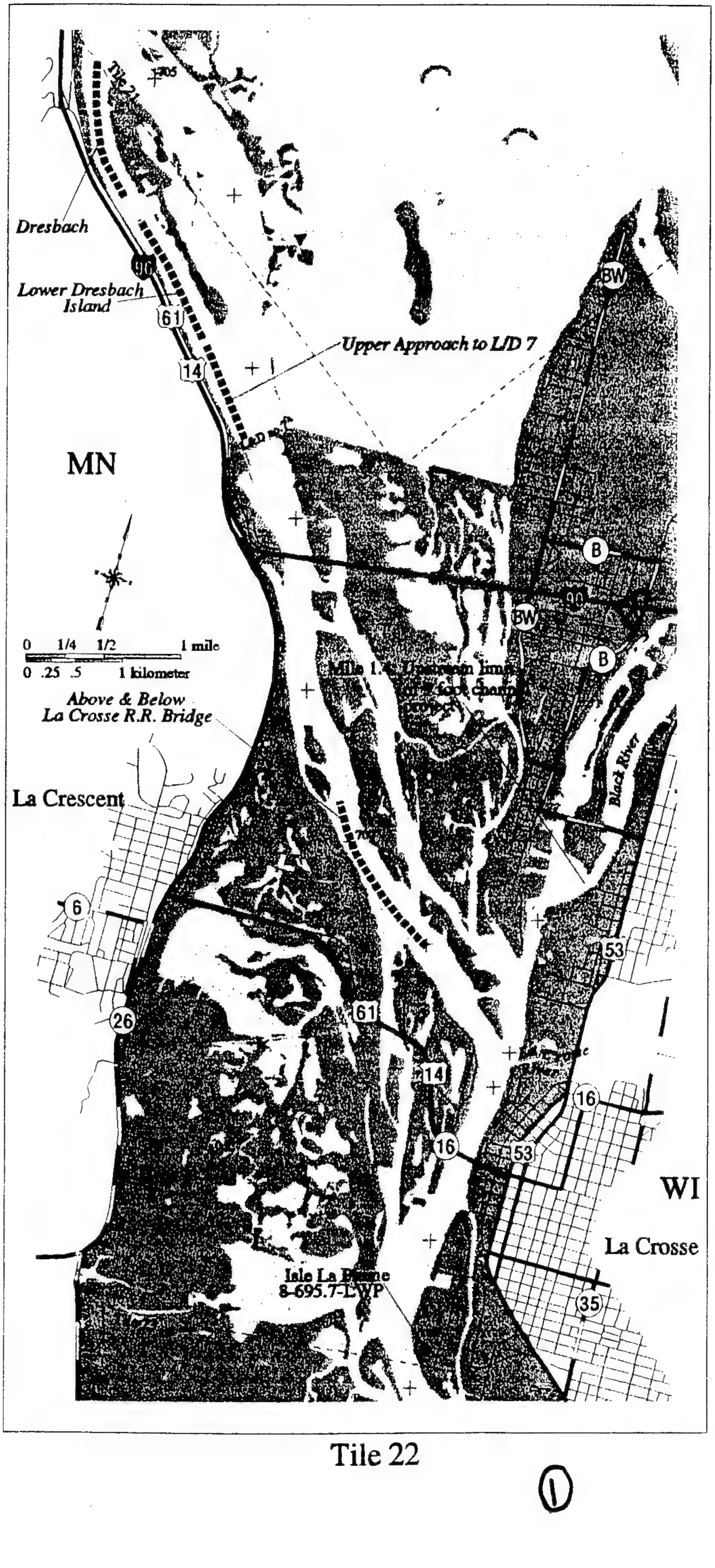
Tile 21

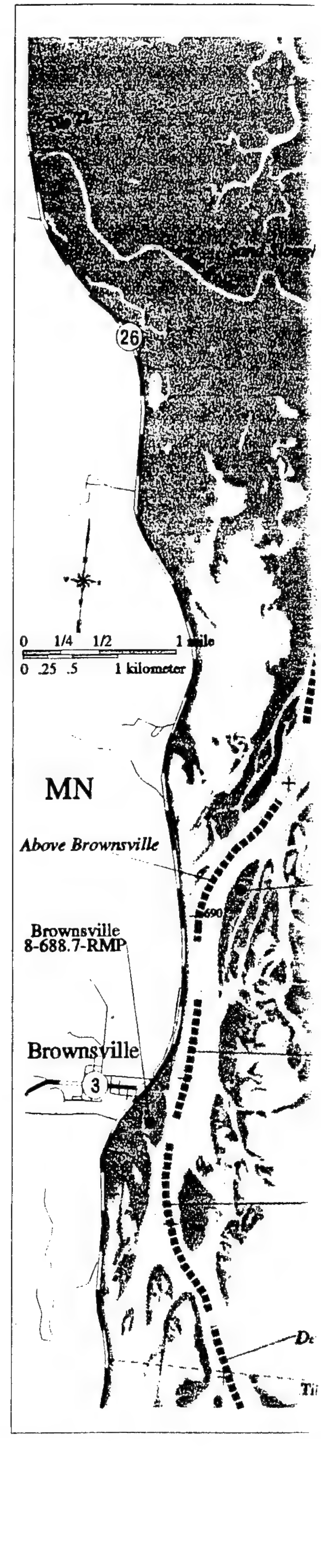

35
Trempealeau
K
Trempealeau
7-714.1-LWP
WI


0 1/4 1/2 1 mile
0 .25 .5 1 kilometer
MN
Tile 20
710
Winters Landing
7-708.7-LWE
Winters Landing
Dakota Boat Ramp
7-707.3-RMP
90
90
12
Dakota
Dakota Island
7-706.5-RMT
WI
Tile 22
705
BW

Tile 21

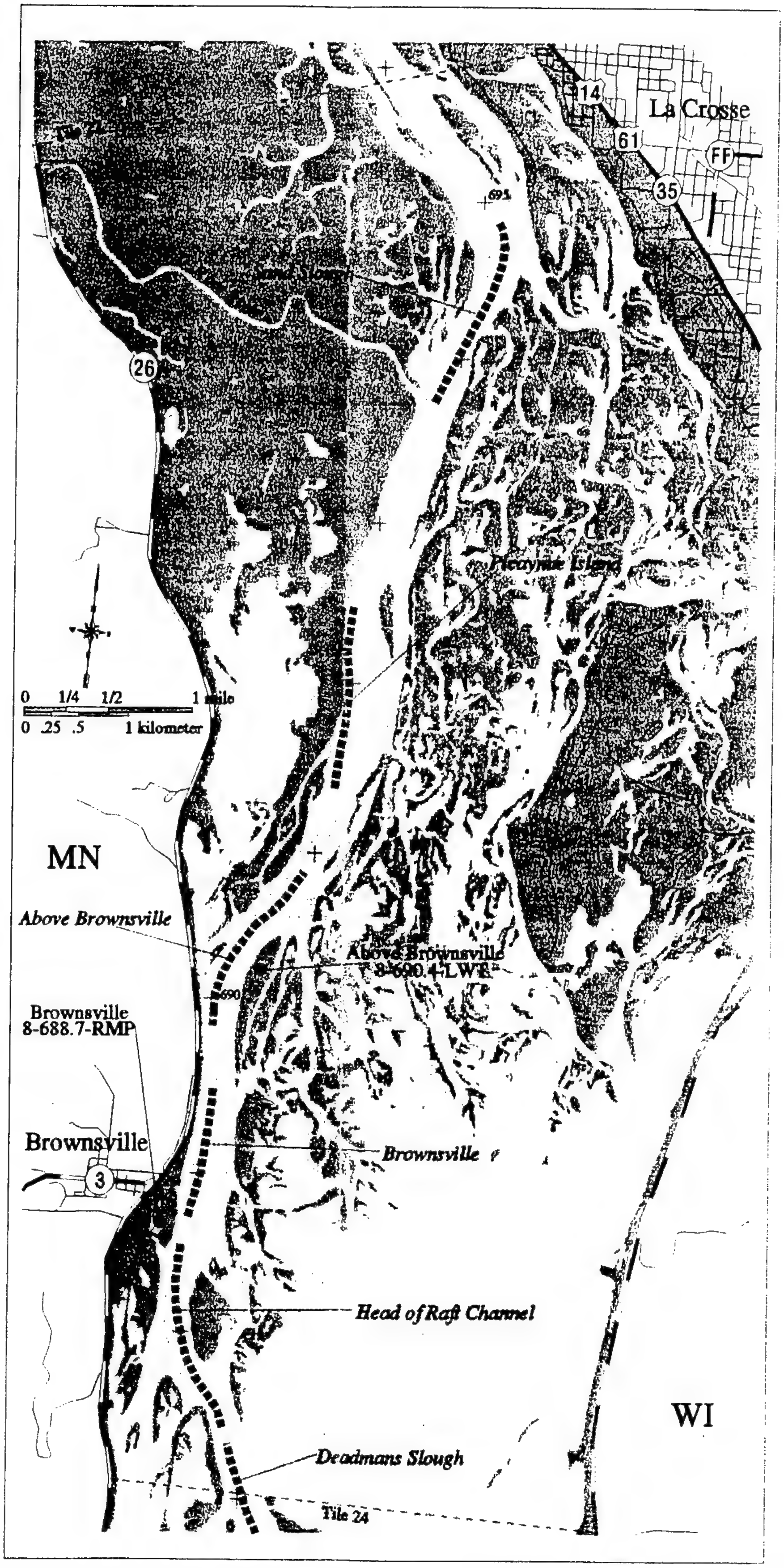
3


Dresbach
Lower Dresbach Island
Upper Approach to L/D 7
MN
0 1/4 1/2 1 mile
0 .25 .5 1 kilometer
Above & Below La Crosse R.R. Bridge
La Crescent
Black River
WI
La Crosse
Isle La Plume 8-695.7-LWP

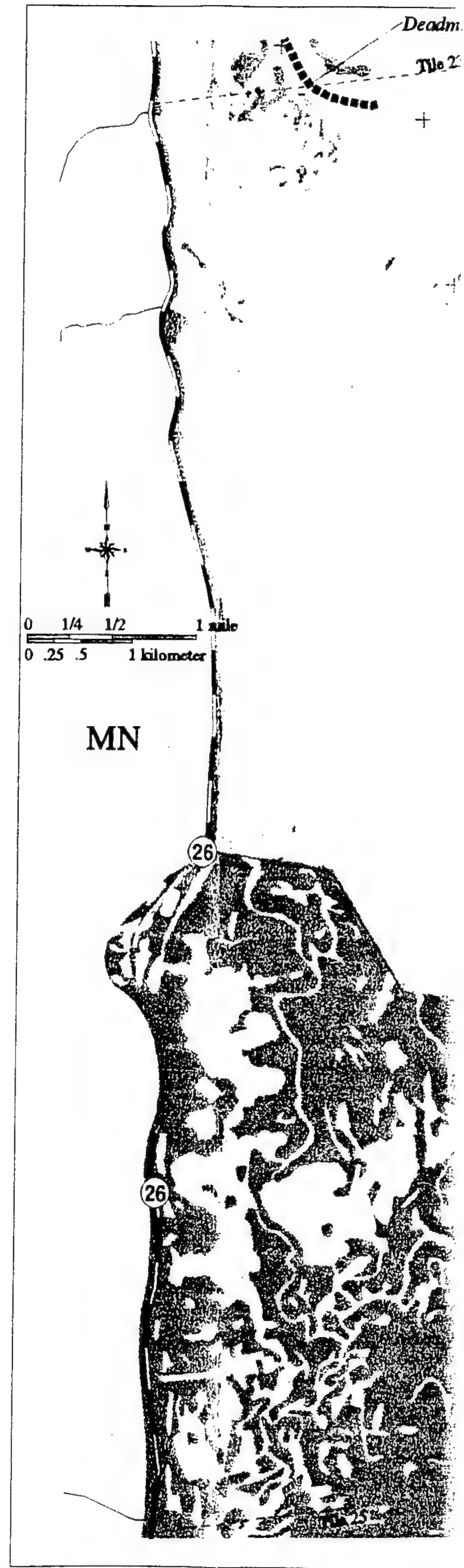

0 1/4 1/2 1 mile
0 .25 .5 1 kilometer
MN
Above Brownsville
Brownsville 8-688.7-RMP
Brownsville

Tile 22

1

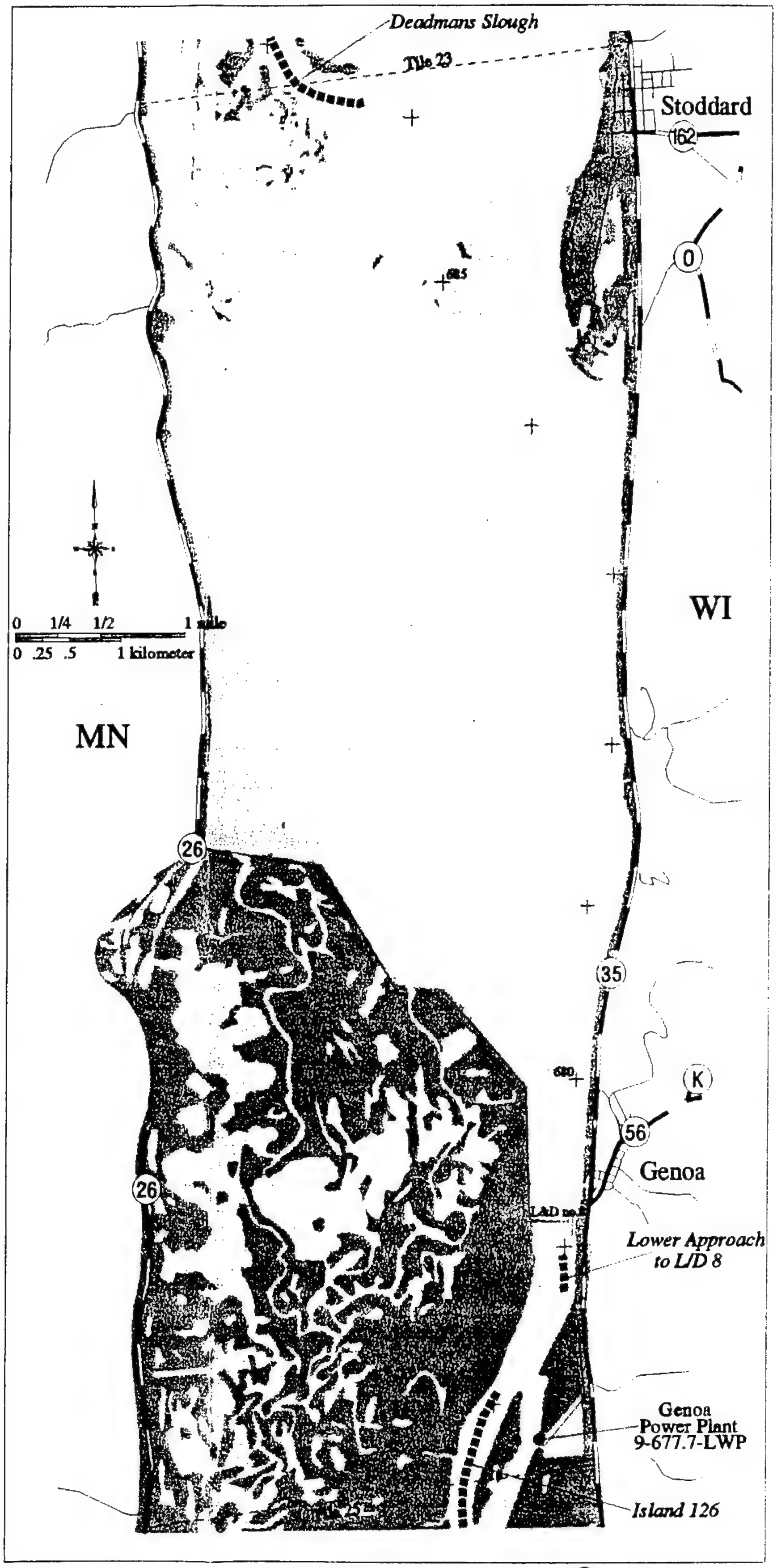


Tile 23



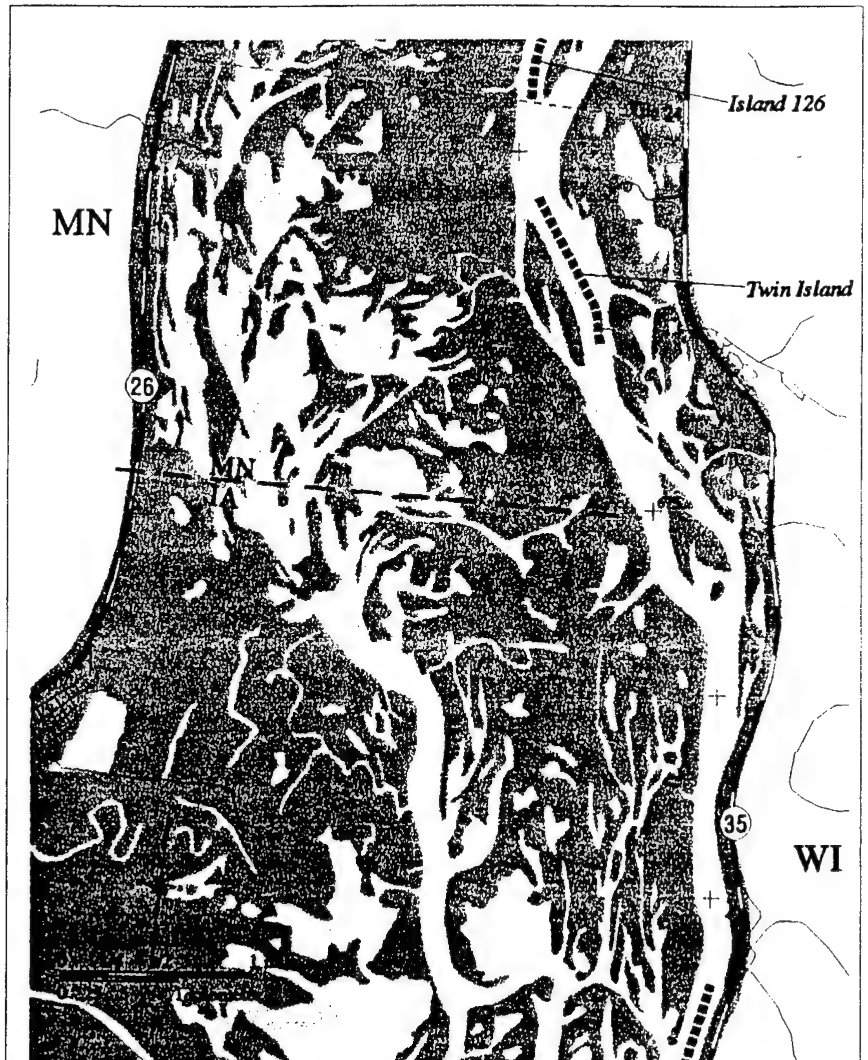
Tile 24


La Crosse
FF
35
WI


Deadmans Slough
Tile 23
Stoddard
162
0
685
WI
0 1/4 1/2 1 mile
0 .25 .5 1 kilometer
MN
26
35
680
K
56
Genoa
26
Lower Approach
to L/D 8
Genoa
Power Plant
9-677.7-LWP
Island 126

Tile 24

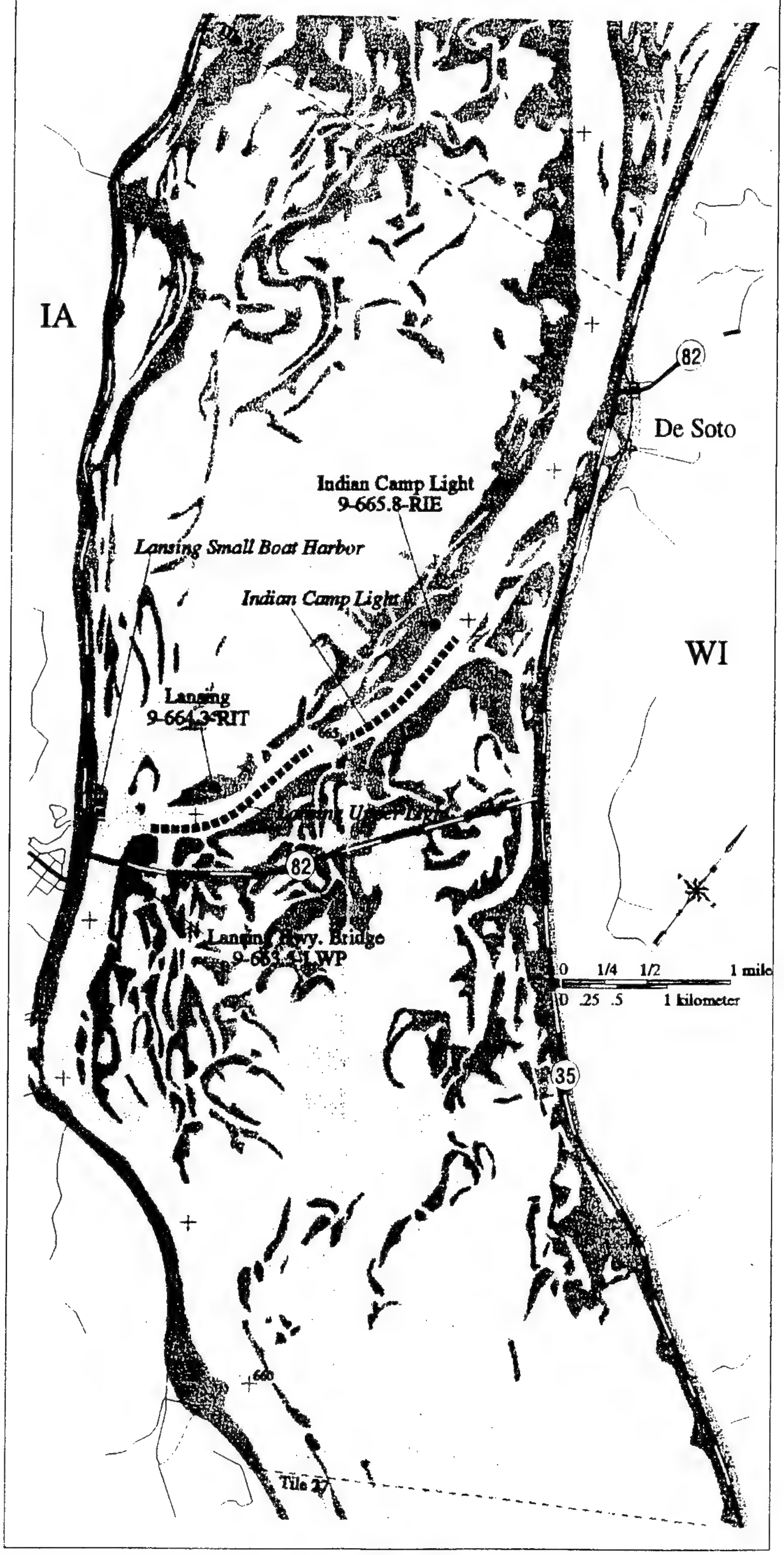
3



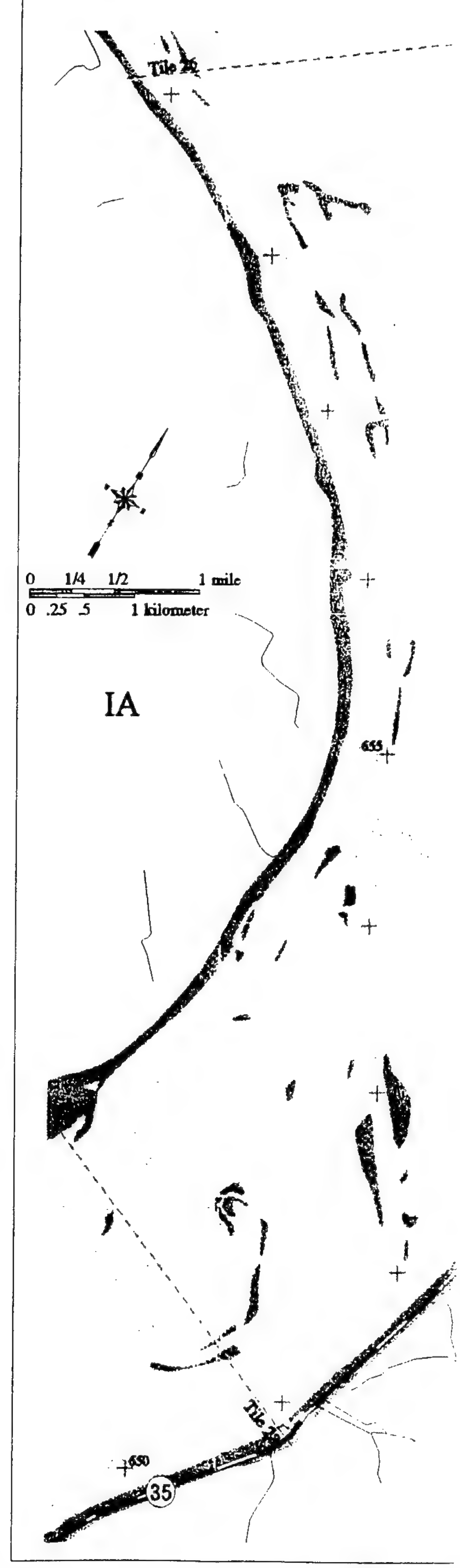
Island 126
MN
Twin Island
26
MN
IA
35
WI
Battle Island
670
26
IA

Tile 25

IA
Lansing Small Boat H
Indian C.
Lansing
9-664.3-RIT
82

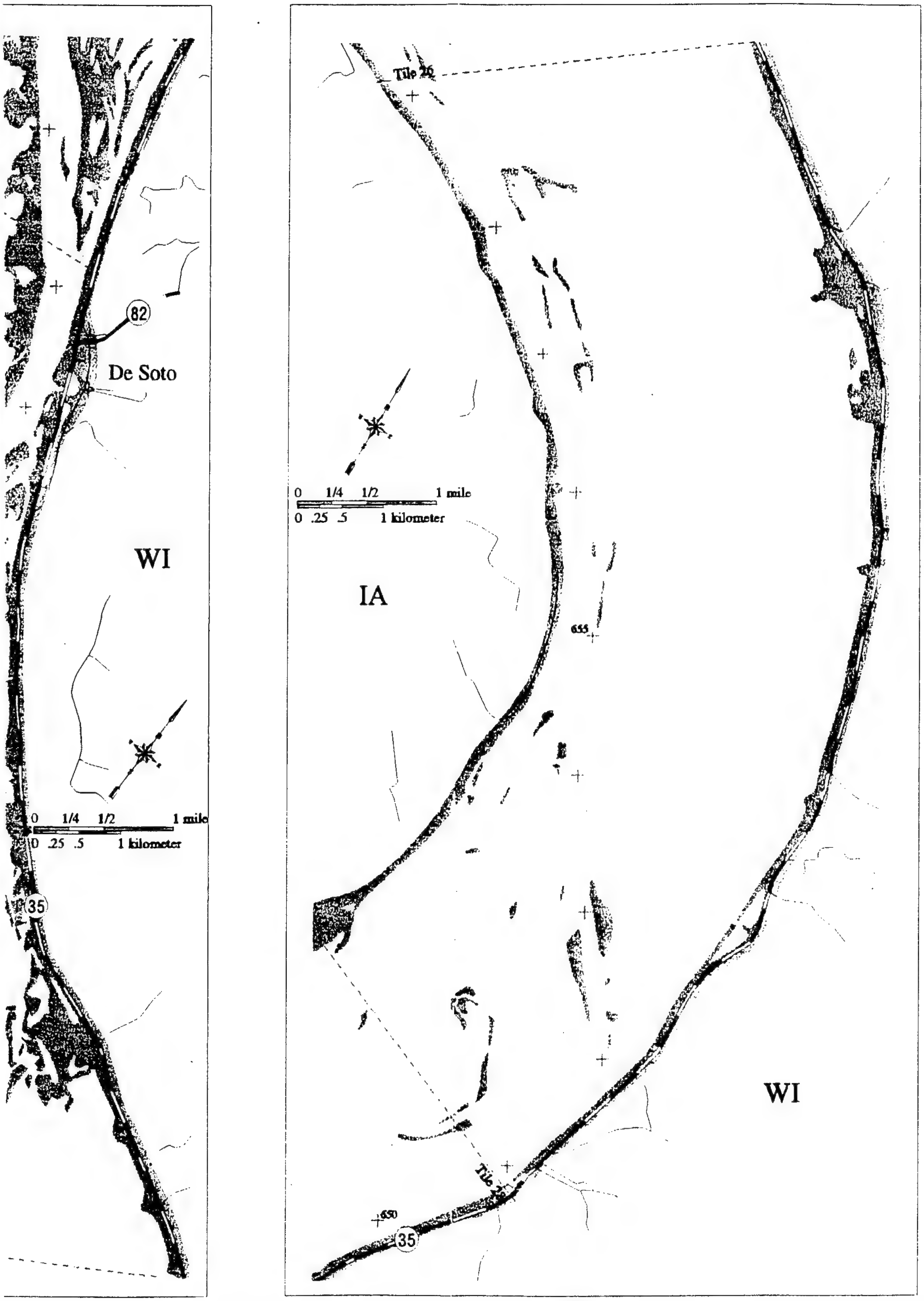


Tile 26



Tile 27

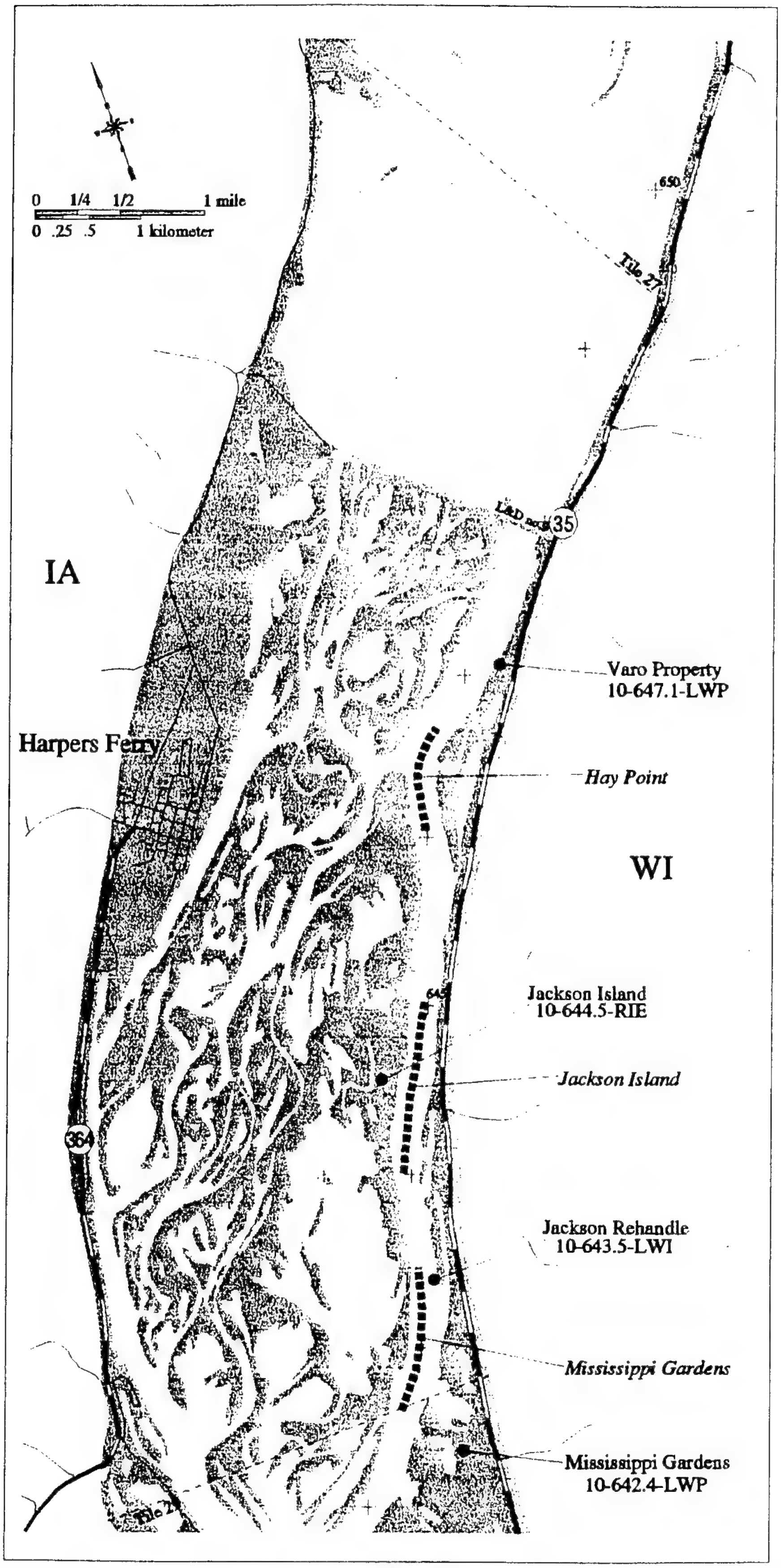
2



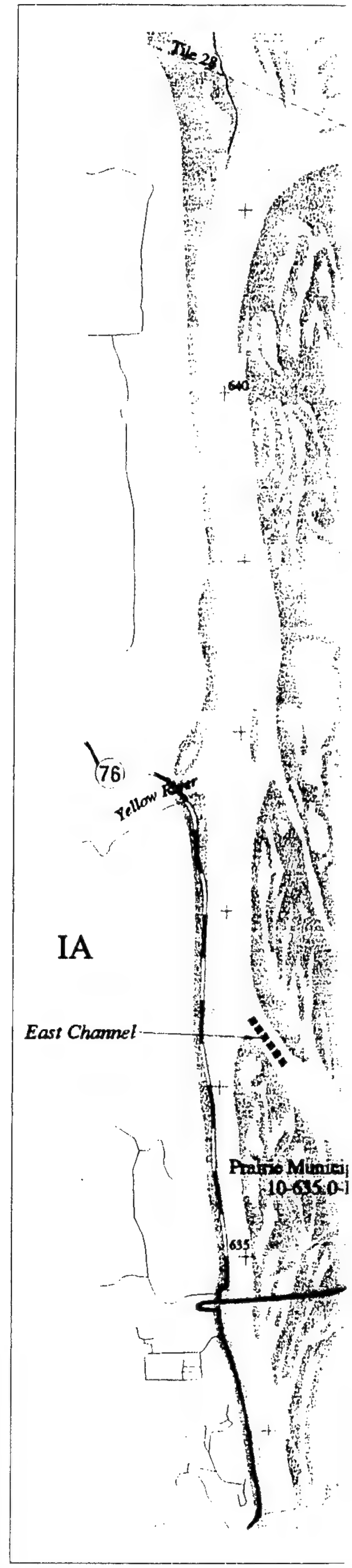
Pool 9: Mile 678 to 650

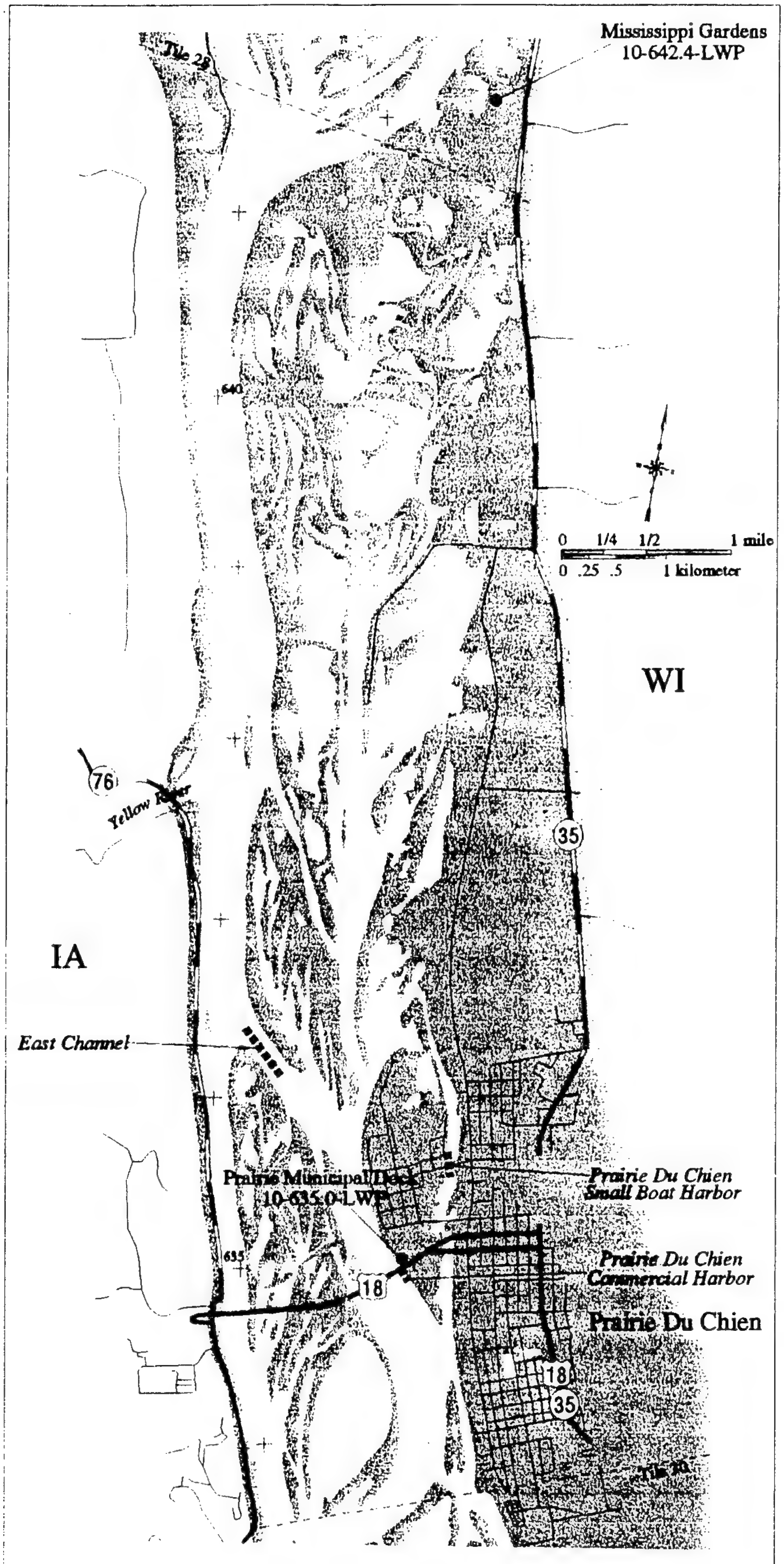
Tile 27

3


0 1/4 1/2 1 mile
0 .25 .5 1 kilometer
650
Tile 27
L&D 9
35
IA
Varo Property
10-647.1-LWP
Harpers Ferry
Hay Point
WI
Jackson Island
10-644.5-RIE
Jackson Island
364
Jackson Rehandle
10-643.5-LWI
Mississippi Gardens
Mississippi Gardens
10-642.4-LWP
Tile 29

Tile 28


Tile 28
640
76
Yellow River
IA
East Channel
635

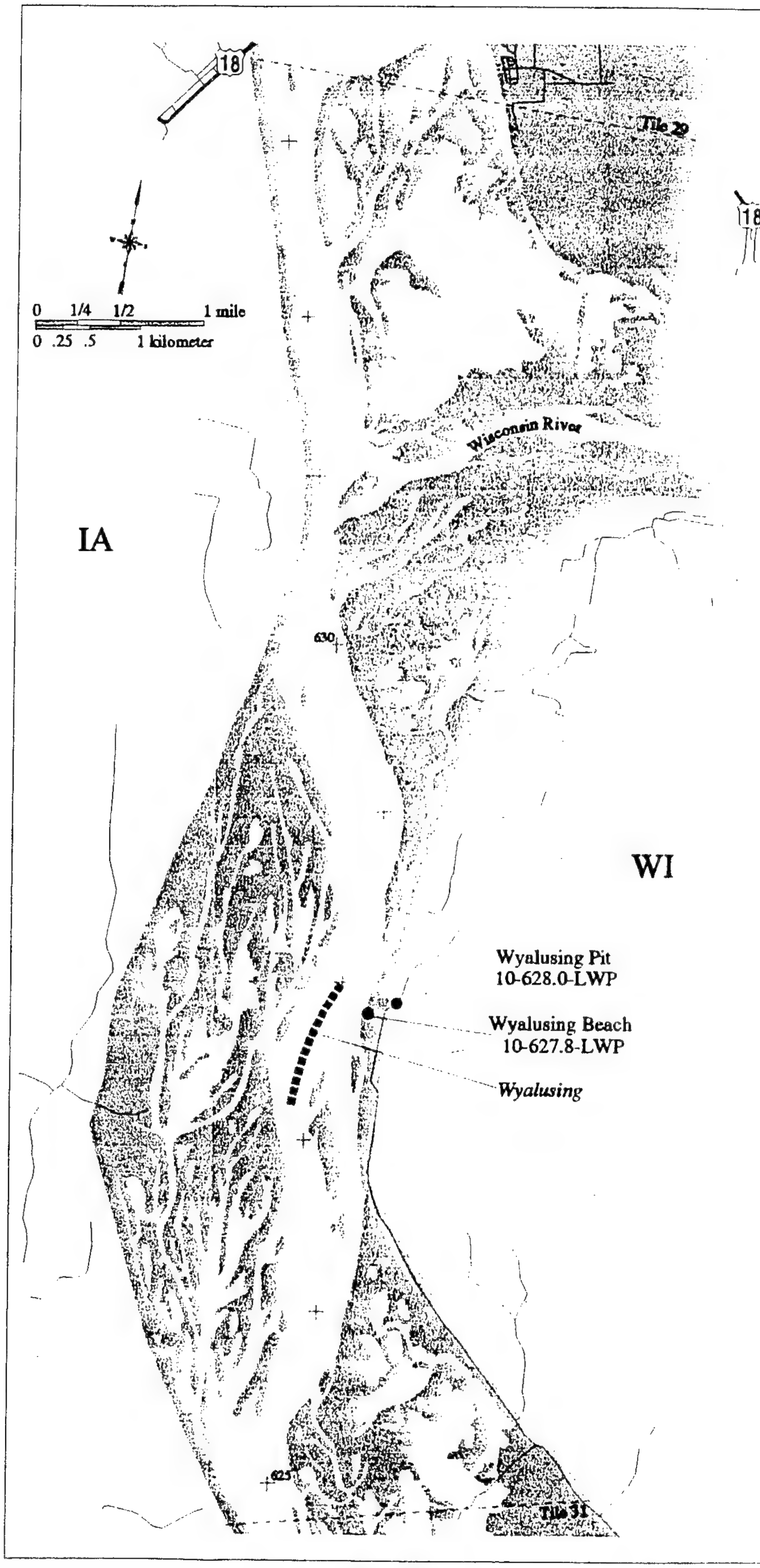


Tile 29

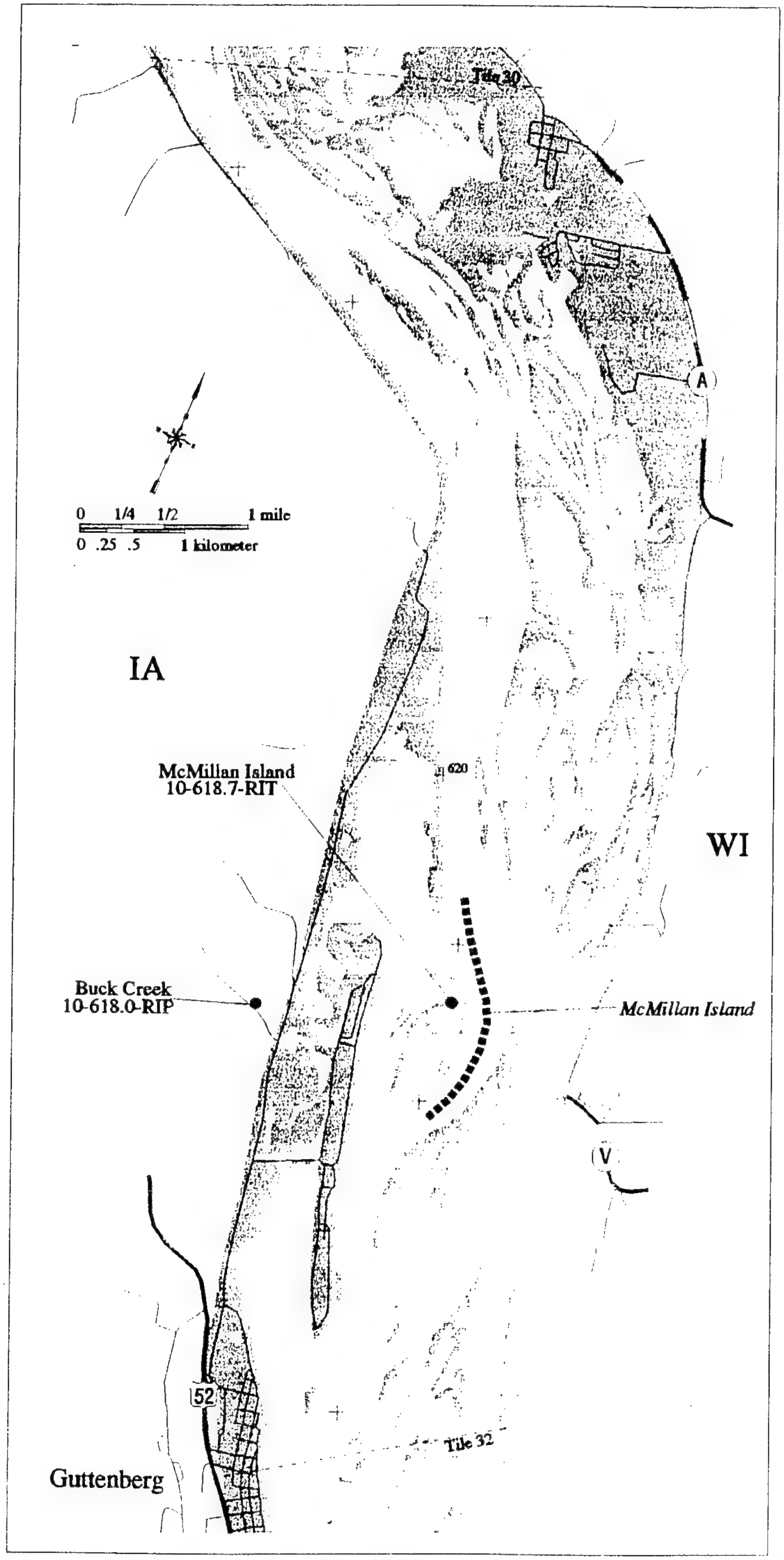
Tile 30

2

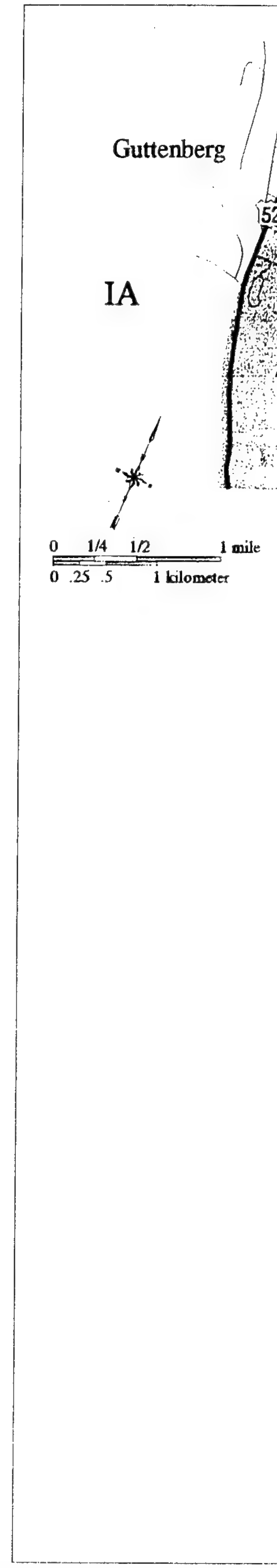

Mississippi Gardens
10-642.4-LWP
1/2
1 mile
1 kilometer
WI
Du Chien
Boat Harbor
Du Chien
Harbor
Du Chien

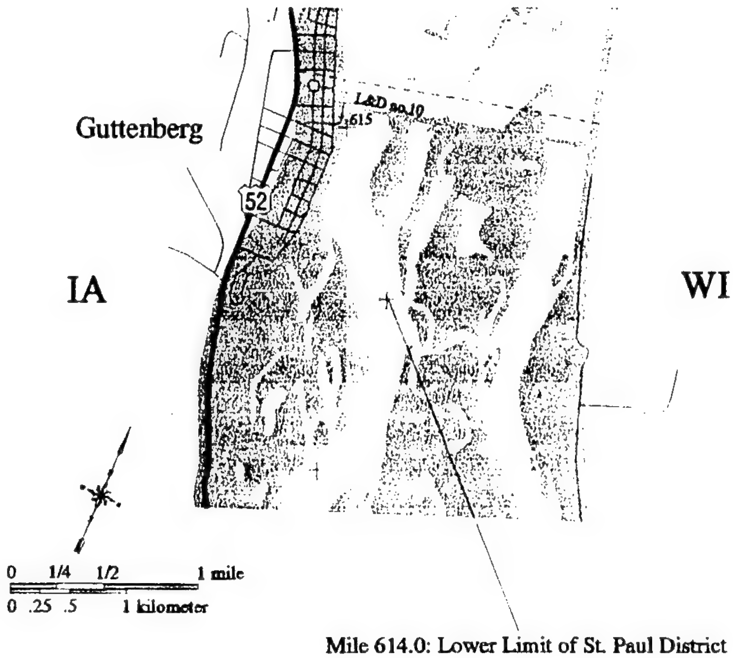

18
Tile 29
18
0 1/4 1/2 1 mile
0 .25 .5 1 kilometer
Wisconsin River
IA
630
WI
Wyalusing Pit
10-628.0-LWP
Wyalusing Beach
10-627.8-LWP
Wyalusing
625
Tile 31

Tile 30


Tile 30
IA
WI
0 1/4 1/2 1 mile
0 .25 .5 1 kilometer
McMillan Island
10-618.7-RIT
620
Buck Creek
10-618.0-RIP
McMillan Island
52
Tile 32
Guttenberg

Tile 31


Guttenberg
52
IA
0 1/4 1/2 1 mile
0 .25 .5 1 kilometer


Guttenberg
L&D no.10
615
52
IA
WI
0 1/4 1/2 1 mile
0 .25 .5 1 kilometer
Mile 614.0: Lower Limit of St. Paul District

Tile 32

2

WI

Paul District

Pools 10 & 11: Mile 625 to 613

3

APPENDIX A

Attachment 2

Distribution List of Channel Maintenance Management Plan

CMMP Distribution

Agency?	Who?	Where?	When Document Sent?
FWS	Asst. Regional Director	Fort Snelling	04/23/96
FWS	Field Supervisor (Lewis)	Bloomington	04/23/96
FWS	(Winona) District Manager	Winona	04/23/96
FWS	(LaCrosse) District Manager	Onalaska	04/23/96
FWS	(McGregor) District Manager	McGregor	04/23/96
COE	CO (Harold Taggatz)	St. Paul	04/23/96
COE	CO-TS (Dennis Cin)	St. Paul	04/23/96
COE	CO-TS (Frank Star)	St. Paul	04/23/96
COE	CO-MS (Marc Krumholz)	St. Paul	04/23/96
COE	CO-R (Ben Wopat)	St. Paul	10/24/96
COE	CO-R-LC (Bruce Norton)	LaCrosse	05/21/96
COE	PE-M (Gary Palesh)	St. Paul	05/09/96
COE	PE-M-ER (Dennis Anderson)	St. Paul	05/09/96
COE	PE-M-ER (Dennis Anderson)	St. Paul	05/09/96
COE	PE-H (HYDRAULICS)	St. Paul	04/23/96
COE	PE-H (HYDRAULICS)	St. Paul	04/23/96
COE	PE-D (John Fisher)	St. Paul	12/10/96
COE	RE-A	St. Paul	09/25/96
COE	DE	St. Paul	05/08/96
COE	CO-E (Melissa Gulan)	Winona	05/10/96
COE	CO-MR (Dean Peterson/Office)	Fountain City	04/23/96
COE	CO-MR (Dean Peterson/Home)	Winona	04/23/96
COE	CO-MR-W (Dan Krumholz/Office)	Fountain City	04/23/96
COE	CO-MR-W (Dan Krumholz/Home)	Winona	04/23/96
COE	CO-MR-W (Steve Tapp/Office)	Fountain City	04/23/96
COE	CO-MR-W (Steve Tapp/Home)	Lewiston	04/23/96
COE	CO-MR-W (Coordinator 2)	Fountain City	05/20/96
COE	CO-MR-W (Joe Lechner)	Fountain City	05/20/96
COE	CO-MR-NR (Dick Otto)	LaCrescent	04/23/96
COE	CO-MR-NR (Tom Novak)	Blackhawk Park	04/23/96
COE	CO-MR-WAT	Fountain City	05/20/96
COE	CO-MR (Library)	Fountain City	05/20/96
COE	CO-MR (Paul Machajewski)	Fountain City	05/20/96
COE	CO-MR-UALM (Ken Tschida)	Hastings	05/21/96
COE	CO-MR-LALM (Ed Helmueller)	Fountain City	05/20/96
COE	CO-MR-U&LSAF	Mpls.	05/21/96
COE	CO-MR-LD1	Mpls.	05/21/96
COE	CO-MR-LD2	Hastings	05/21/96
COE	CO-MR-LD3	Welch	05/21/96
COE	CO-MR-LD4	Alma	05/21/96
COE	CO-MR-LD5	Minnesota City	05/21/96
COE	CO-MR-LD5A	Fountain City	05/21/96
COE	CO-MR-LD6	Trempealeau	05/21/96
COE	CO-MR-LD7	LaCrescent	05/21/96
COE	CO-MR-LD8	Genoa	05/21/96
COE	CO-MR-LD9	Eastman	05/21/96
COE	CO-MR-LD10	Guttenberg	05/21/96

CMMP Distribution

Agency?	Who?	Where?	When Document Sent?
COE	OCE	Wash. D.C.	05/21/96
COE	CECW-PD (Norman T. Edwards)	Wash. D.C.	10/25/96
COE	NCD	Chicago	05/15/96
COE	NCR (Jim Aidala)	Rock Island	05/15/96
COE	NCR (Mike Cockerill)	Rock Island	05/15/96
COE	LMS (Steve Derker)	St. Louis	05/21/96
COE	LMS (Owen Dutt)	St. Louis	05/15/96
COE	PA	St. Paul	10/24/96
COE	NCR (Mike Cox)	Rock Island	06/18/96
COE	NCR (Mike Cox)	Rock Island	06/18/96
Contractor	J.F. Brennan (Tony Binsfield)	LaCrosse	05/10/96
Contractor	L&S Industrial Marine (Jim V.)	Hugo	06/17/96
Contractor	L.W. Matteson (Larry Matteson)	Burlington	05/21/96
MDNR	Steve Johnson (Lafayette-Box 4032)	St. Paul	04/23/96
MDNR	Pete Otterson (Lafayette-Box 4032)	St. Paul	04/23/96
MDNR	Steve Colvin (Lafayette-Box 4025)	St. Paul	04/23/96
MDNR	Brian McCann (Lafayette-Box 4052)	St. Paul	04/23/96
MDNR	MDNR Library (Lafayette-Box 4021)	St. Paul	04/23/96
MDNR	Wayne Barstad (1200 Warner Rd.)	St. Paul	04/23/96
MDNR	Bill Weir (1200 Warner Rd.)	St. Paul	04/23/96
MDNR	Rob Collett (1200 Warner Rd.)	St. Paul	10/25/96
MDNR	Scot Johnson	Lake City	04/23/96
MDNR	Tim Schlagenhaft	Lake City	04/23/96
MDNR	Jim Cooper	Rochester	04/23/96
MDNR	Nick Gulden	Winona	04/23/96
MN - SHPO	Minnesota Historical Society	St. Paul	10/25/96
IDNR	Kevin Szcodronski	DesMoines	04/23/96
IDNR	Art Roseland & Dave Moeller	Manchester	04/23/96
IDNR	Mike Griffen	Bellevue	04/23/96
IDNR	Gary Ackerman	Guttenberg	04/23/96
IDNR	Dan Dolan	Fayette	04/23/96
IDNR	Bob Kurtt	Decorah	04/23/96
IA - SHPO	Dept. of Cultural Affairs	Des Moines	10/25/96
IDOT	Jim Hall	Ames	04/23/96
WDNR	Terry Moe	LaCrosse	04/23/96
WDNR	Gretchen Benjamin	LaCrosse	04/23/96
WDNR	Gretchen Benjamin	LaCrosse	04/23/96
WDNR	Kurt Welke	Prairie Du Chien	04/23/96
WDNR	Brian Brecka	Alma	04/23/96
WI-SHPO	Richard Dexter	Madison	04/23/96
WDOT	Ellen Fisher	Madison	04/23/96
WDOT	Donald Fiscus	LaCrosse	05/22/96
MDOT	Dick Lambert	St. Paul	04/23/96
MDOT	Stephan Alderson	Rochester	07/08/96
MWBAC	Dan McGuiness	Hudson	04/23/96
NPS	JoAnn Kyral	St. Paul	04/23/96
NPS	JoAnn Kyral	St. Paul	05/21/96

CMMP Distribution

Agency?	Who?	Where?	When Document Sent?
NPS	JoAnn Kyral	St. Paul	05/21/96
MPCA	Judy Mader	St. Paul	04/23/96
MRRPC	Bob Fisher	LaCrosse	05/21/96
USCG	Bob McFarland	St. Paul	05/21/96
EPA	Al Fenedick	Chicago	05/21/96
SCS	Jon De Groot	St. Paul	05/21/96
EMTC	-----	LaCrosse	05/21/96
UMRBA	-----	St. Paul	05/21/96
UMWA	Russ Eichman	St. Paul	05/15/96
UMRCC	Jon Duyvejonck	Rock Island	05/21/96
URS	Lee Nelson	St. Paul	05/21/96
Izaak WL	Paul Hanson	Gaithsburg, MD	06/18/96
Izaak WL	Bill Grant	Mpls.	06/18/96
Mankato St. Univ.	Jim Jack	Mankato	06/18/96
Washington Co.	Dave Engstrom	Stillwater	06/24/96
Dakota Co.	Lynn Moratzka	Apple Valley	06/24/96
Public Library	Mpls. Public Central Library	Mpls.	10/25/96
Public Library	St. Paul Pub. Central Library	St. Paul	10/25/96
Public Library	Park Grove Branch	Cottage Grove	10/25/96
Public Library	Pleasant Hill Library	Hastings	10/25/96
Public Library	Prescott Public Library	Prescott	10/25/96
Public Library	Hudson Public Library	Hudson	10/25/96
Public Library	Red Wing Public Library	Red Wing	10/25/96
Public Library	Lake City Public Library	Lake City	10/25/96
Public Library	Pepin Public Library	Pepin	10/25/96
Public Library	Wabasha Public Library	Wabasha	10/25/96
Public Library	Alma Public Library	Alma	10/25/96
Public Library	Winona Public Library	Winona	10/25/96
Public Library	Hettie Pierce Public Library	Trempealeau	10/25/96
Public Library	LaCrosse Public Library	LaCrosse	10/25/96
Public Library	Holman Area Library	Holman	10/25/96
Public Library	Lansing Public Library	Lansing	10/25/96
Public Library	Prairie du Chien Mem. Library	Prairie du Chien	10/25/96
Public Library	Guttenberg Public Library	Guttenberg	10/25/96

Table of Contents

List of Tables

SITE-SPECIFIC IMPACT ASSESSMENT OF DREDGING AND DREDGED MATERIAL PLACEMENT OF GREAT I PLAN AND CMMP

B-INTRODUCTION

Planning for long-term dredging and dredged material placement involved the development of alternative placement plans. Plans were developed for entire pools, portions of pools, or specific dredge cuts. Pools were subdivided because of natural geographic features or because of the unique problems or conditions associated with a particular dredge cut or pool reach.

The GREAT I recommended alternative is the "No Action" alternative. Often, further analysis shows the GREAT I recommended alternative requires adjustment to compensate for changes in volume projections, deletion of unavailable or unnecessary sites, changes in site design, and/or other information developed since the completion of the GREAT I study.

Placement sites are identified by a 3-part alphanumeric code denoting the pool, river mile, side of the navigation channel, and State where the site is located and the type of site. For example, Site 7-714.1-LWP is located in pool 7 at river mile 714.1 on the left (L) descending bank of the navigation channel in the State of Wisconsin (W) and is a permanent (P) placement site. Sites located in Minnesota and Iowa are noted by the letters "M" and "I", respectively. Strictly emergency sites are designated with an "E" such as Site 1-851.3-LME. Transfer or upland "rehandling" sites, evaluated for short-term storage of materials, are noted with a "T" such as Site 2-821.1-LMT. In-water "rehandling sites" are designated with an "I" such as Site 10-643.5-LWI. To assist readers in identifying particular sites, the GREAT I site number and common names (if they exist) are included in various locations throughout this Appendix.

The following discussion is to provide assistance in interpretation of the material presented in this section.

Water Quality - The water quality effects of dredged material placement are generally related to placement method. Many alternative sites considered can be accessed by both mechanical and hydraulic dredging equipment.

Fish and Wildlife - Dredged material placement impacts on fish and wildlife resources are best reflected in the acres of habitat lost under any particular alternative. The habitat types affected include:

Upland - Upland forest and/or brush, grassland or old field, woody or herbaceous vegetation dominant.

Agriculture - Areas devoted to production of annual crops, pastures or landscape nurseries.

Disturbed Terrestrial - Areas dominated by industrial, commercial or residential use, including roads and highways, gravel pits, coal terminals, marinas, industrial buildings, family residences.

Old Dredged Material - Old dredged material deposits in various stages of revegetation, including bare sand.

Recreational Beach - Natural or manmade sand areas where low to high recreational beach designation have been assigned due to documented use.

Bottomland Forest - Bottomland forests and inland fresh meadows (type 1 and 2 wetlands, respectively) (Shaw and Fredine 1971).

Shallow Marsh Wetlands - Fresh marsh wetlands consisting of type 3 (shallow), 4 (deep) and 5 (open water) wetlands (Shaw and Fredine 1971).

Aquatic - Both shallow and deep aquatic, typically main channel border habitat.

National Wildlife Refuge - Most impacts on the refuges are reflected under the impacts on fish and wildlife resources. The acreage within the refuge used for dredged material placement purposes is noted.

Socioeconomic - The cubic yards of material used for beneficial uses includes material removed for beneficial use and/or material used on-site for a beneficial purpose.

B-1.0 UPPER ST. ANTHONY FALLS POOL

B-1.1 SITE-SPECIFIC IMPACTS OF DREDGING

B-1.1.1 GREAT I Channel Maintenance Plan

The GREAT I study recommended placement sites for three historic dredge cuts in the USAF pool (Table B-1). A projected quantity of 1,505,000 cubic yards of dredged material would be removed from these cuts over the 40-year planning horizon.

B-1.1.2 CMMP

Placement site planning was completed for the same dredge cuts identified by GREAT I; however, to better manage the projected quantity dredged from these cuts, the Above and Below Broadway/Plymouth Avenue Bridge cut was divided into two separate cuts (Table B-1). A projected quantity of 1,505,000 cubic yards of dredged material would be removed from these cuts over the 40-year planning horizon.

Table B-1. Dredge cuts, Upper St. Anthony Falls pool.

Pool-Cut #	Cut Name	Location (RM)	GREAT I Status	CMMP Status
USAF-3	Minneapolis Turning Basin	856.8 to 857.6	Active	Active
USAF-2	Above Lowry Ave. Bridge	856.4 to 856.8	Active	Active
USAF-1B*	Broadway Avenue Bridge	855.3 to 856.1	Active	Active
USAF-1A*	Above Plymouth Avenue Bridge	854.8 to 855.5	Active	Active

* The Broadway Avenue Bridge and Above Plymouth Avenue Bridge cuts were considered one cut under GREAT I.

B-1.1.3 Impacts of Dredging

Under both the GREAT I plan and CMMP, an estimated total volume of 1,505,000 cubic yards of material would be removed from USAF over the 40-year planning horizon. The impacts of dredging the cuts of the USAF pool are summarized below.

Acreage affected under GREAT I = 49.1 acres of main channel habitat.
Acreage affected under CMMP = 49.1 acres of main channel habitat.

a. Minor impact on benthic invertebrates and fish.
b. Sediments are relatively uncontaminated; no impacts on water quality expected.
c. Freshwater mussels once extirpated now recovering in the USAF pool; minor adverse effects on this resource.
d. No adverse impacts on Federal threatened or endangered species (see Appendix C).

e. Short-term displacement of recreational craft; minor or negligible effect.
f. No cultural resources affected.
g. No appreciable social impacts.

B-1.1.4 Comparison of Plans

Both plans would have similar but no more than minor impacts on environmental resources (Tables B-2 and B-3).

B-1.2 SITE-SPECIFIC IMPACTS OF DREDGED MATERIAL PLACEMENT

B-1.2.1 GREAT I Channel Maintenance Plan

The GREAT I study evaluated three potential placement sites in the USAF pool. The evaluation of impacts of use of alternative placement sites and the justification for recommendation of sites for the USAF pool are provided on pages 92-93 of the GREAT I EIS (Volume 9 of the GREAT I Technical Appendices) and incorporated by reference in this document. Sites **U-857.1-RMP (U.02)** and **U-854.7-LMP (U.03)** were considered acceptable for use and recommended by GREAT I. Site U-857.1-RMP (U.02) was recommended as the primary site because, at the time, the site was preferred by the city of Minneapolis (the entity responsible for providing placement sites in USAF) and access to the site would promote beneficial use of materials by public agencies. If the GREAT I plan were implemented, both Sites U-857.1-RMP (U.02) and U-854.7-LMP (U.03) would be used. Descriptions of the existing conditions and site development impacts for the GREAT I recommended sites are provided in Volume 8 of the Technical Appendices of the GREAT I study. These impacts are summarized below.

B-1.2.2 CMMP

In subsequent planning for implementation of the GREAT I plan, an additional site suited for placement of dredged material, Site U-856.6-RMP (USAF Site), was evaluated in addition to the selected GREAT I sites. Site **U-856.6-RMP (USAF Site)** was selected for use under the CMMP. An assessment of the impacts of using this site is provided in preceding sections of this document. Site U-856.6-RMP (USAF Site) was selected for several reasons. First, use of the site would have little effect on the human environment (see discussion of impacts below). Secondly, the site is preferred by the city of Minneapolis. And, thirdly, the site is already used for dredged material stockpiling, and no further site development measures are required. Descriptions of the existing conditions and proposed developments at this site are provided in TAB 10 of the CMMP. The impacts of using Site U-856.6-RMP (USAF Site) are summarized below. For additional detail on the impacts of the GREAT I plan and CMMP, the reader should refer to Section 5.0 of this EIS, the GREAT I EIS, the Section 404(b)(1) Evaluation (see Appendix D) and the Biological Assessment (see Appendix C).

B-1.2.3 Impacts of Site Use

U-857.1-RMP (U.02) - GREAT I recommended primary site

Site U-857.1-RMP (U.02) is a disturbed upland site owned by the City of Minneapolis in an industrial development adjacent to the river. The site is within the flood fringe of the UMR.

Acreage affected under GREAT I = 3 acres of disturbed terrestrial habitat.

a. Little or no impact on fish and wildlife resources.
b. No water quality impacts for mechanical placement; minor impacts if hydraulic.
c. No assessment of impacts on threatened and endangered species completed.
d. Potential floodplain impacts if material is not removed prior to seasonal high water.
e. No recreation impacts.
f. Very low potential for cultural resource impacts; however, the site must be coordinated with MNSHPO.
g. No appreciable social impacts; however, safety concerns associated with residential unit located 1,000 feet from site.
h. Anticipated beneficial use of materials is high; 100 percent removal projected.
i. No appreciable impacts on aesthetics (visual qualities of area already disturbed by existing site uses).

U-856.6-RMP (USAF Site) - CMMP selected site

Site U-856.6-RMP (USAF Site) is the Packer Terminal owned by the City of Minneapolis. This disturbed upland site is adjacent to the river in an industrial/commercial development. The site is currently used for dredged material stockpiling.

Acreage affected under the CMMP = 7 acres of disturbed terrestrial habitat.

a. Little or no impact on fish and wildlife resources.
b. No water quality impacts for mechanical placement; minor impacts if hydraulic.
c. No adverse impacts on Federal threatened or endangered species (see Appendix C).
d. No adverse floodplain impacts (site is out of the floodplain and floodway).
e. No recreation impacts.
f. Very low potential for cultural resource impacts; however, site must be coordinated with MNSHPO.
g. No appreciable social impacts; safety concerns associated with overhead power line.
h. Anticipated beneficial use of materials is high; 100 percent removal projected.
i. No appreciable impacts on aesthetics (visual qualities of site already disturbed by existing site uses).

U-854.7-LMP (U.03) - GREAT I recommended secondary site

Site U-854.7-LMP (U.03) is a disturbed upland site previously used for disposal of dredged material. The site is out of the floodplain.

Acreage affected under GREAT I = 7 acres of disturbed terrestrial habitat.

a. Little or no impact on fish and wildlife resources
b. No water quality impacts for mechanical placement; minor impacts if hydraulic.
c. No assessment of impacts on threatened and endangered species completed.
d. No floodplain impacts (site is out of the floodplain and floodway).
e. No recreation impacts.
f. Very low potential for cultural resource impacts; but, site must be coordinated with MNSHPO.
g. No appreciable social impacts.
h. Anticipated beneficial use of materials is high; 100 percent removal projected.
i. No appreciable impacts on aesthetics (visual qualities of site already disturbed).

B-1.2.4 Comparison of Plans

Both plans would have minor or negligible impacts on water quality (Tables B-2 and B-3). From a hydraulic dredging standpoint, the CMMP plan would have less potential for impact because Site U-856.6-RMP (USAF Site) is a larger site and would provide more retention time than Site U-857.1-RMP (U.02), the primary site under the GREAT I plan.

Neither plan would have significant adverse impacts on fish and wildlife resources (Tables B-2 and B-3). Ten and seven acres of disturbed terrestrial habitat would be converted to dredged sand habitat under the GREAT I plan and CMMP, respectively. The CMMP would have no effect on threatened and endangered species as documented in the biological assessment (see Appendix C; Table B-3). The impacts of the GREAT I plan on threatened and endangered species have not been assessed (Table B-2). Neither plan would have adverse impacts on recreational resources (Tables B-2 and B-3).

Use of Site U-856.6-RMP (USAF Site) would not affect archeological and historic resources; however, coordination with the Minnesota SHPO would need to be completed prior to use of this site. Site U-857.1-RMP (U.02) has been used in the past and material is stockpiled there now. Continued use of this site would have no effect on archeological and historic resources; however, coordination with the Minnesota SHPO would need to be completed prior to site use.

Both plans would have safety concerns associated with site use (Tables B-2 and B-3). Beneficial use of all materials is anticipated regardless of the plan or site selected; however, Site U-856.6-RMP (USAF site; selected site under the CMMP) is currently the preferred site of the local sponsor.

Table B-2. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

UPPER ST. ANTHONY - GREAT

	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels				X			
2. Aesthetic Values				X			
3. Recreational Opportunities				X			
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use				X			
10. Controversy				X			
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services				X			
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply				X			
8. Commercial Navigation			X				
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands				X			
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion				X			
6. Biological Productivity				X			
7. Surface Water Quality				X			
8. Water Supply					X		
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				U*			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				X			

* U = undefined or undetermined for the current stage of planning.

Table B-3. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

UPPER ST. ANTHONY - CMMP

	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels				X			
2. Aesthetic Values				X			
3. Recreational Opportunities				X			
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use				X			
10. Controversy				X			
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services				X			
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply				X			
8. Commercial Navigation			X				
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands				X			
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion				X			
6. Biological Productivity				X			
7. Surface Water Quality				X			
8. Water Supply					X		
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				X			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				X			

B-2.0 POOL 1

B-2.1 SITE-SPECIFIC IMPACTS OF DREDGING

B-2.1.1 GREAT I Channel Maintenance Plan

The GREAT I study recommended placement sites for seven historic dredge cuts in the USAF pool (Table B-4). A projected quantity of 3,034,000 cubic yards of dredged material would be removed from these cuts over the 40-year planning horizon.

B-2.1.2 CMMP

Placement site planning was completed for the same dredge cuts identified by GREAT I; however, the Below Lower St. Anthony Falls cut was divided into two separate cuts (i.e., Lower Approach to Lower St. Anthony Falls and Washington Avenue Bridge) to facilitate dredged material placement planning (Table B-4). A projected quantity of 3,034,000 cubic yards of dredged material would be removed from pool 1 over the 40-year planning horizon.

Table B-4. Dredge cuts, Pool 1.

Pool-Cut #	Cut Name	Location (RM)	GREAT I Status	CMMP Status
1-7B*	Lower Approach to LSAF	853.4	Active	Active
1-7A*	Washington Avenue Bridge	852.5 to 853.0	Active	Active
1-6	Above Franklin Avenue Bridge	851.6 to 852.4	Active	Active
1-5	Below Franklin Avenue Bridge	850.7 to 851.4	Active	Active
1-4	Above Lake Street Bridge	849.9 to 850.5	Active	Active
1-3	Below Lake Street Bridge	848.9 to 849.9	Active	Active
1-2	St. Paul Daymark	848.5 to 848.9	Active	Active
1-1	Upper Approach to L/D 1	847.7 to 848.4	Active	Active

* The Lower Approach to LSAF and Washington Avenue Bridge cuts were considered one cut under GREAT I.

B-2.1.3 Impacts of Dredging

Over the 40-year planning period, an estimated 3,034,000 cubic yards of material would be dredged from pool 1 under both plans. The impacts of dredging the cuts of pool 1 are summarized below.

Acreage affected under GREAT I = 116.4 acres of main channel habitat.
Acreage affected under CMMP = 116.4 acres of main channel habitat.

a. Minor impacts on benthic invertebrates and fish.

b. Sediments are fine to medium sands with some contamination; minor impacts on water quality.
c. Freshwater mussels once extirpated now recovering in pool 1; minor adverse effects on this resource.
d. No determination of the effects of dredging cuts 1-7A and 1-1 on Federal threatened and endangered species (mussel survey and coordination required; see Appendix C). No adverse impacts on Federal threatened or endangered species from dredging remaining active cuts.
e. Short-term displacement of recreational craft; minor or no effect.
f. No cultural resources affected.
g. No appreciable social impacts.

B-2.1.4 Comparison of Plans

Neither the GREAT I nor the CMMP plan would have significant adverse impacts on any environmental resources (Tables B-5 and B-6). The CMMP would have no adverse impacts on Federal threatened and endangered species (Table B-6), however, two dredge cut must be surveyed for threatened and endangered unionids to confirm this determination. The effects of the GREAT I plan on threatened and endangered species have not been assessed (Table B-5).

B-2.2 SITE-SPECFIC IMPACTS OF DREDGED MATERIAL PLACEMENT

B-2.2.1 GREAT I Channel Maintenance Plan

The GREAT I study evaluated five sites for both permanent and emergency placement of materials dredged from pool 1. The evaluation of impacts of use of these alternative placement sites and the justification for recommendation of sites for pool 1 are provided on pages 94-95 of the GREAT I EIS (Volume 9 of the GREAT I Technical Appendices) and incorporated by reference in this document. The GREAT I channel maintenance plan recommended Site **1-853.1-RMP (1.01)** as the primary permanent placement site for pool 1. Three emergency hydraulic placement sites were also recommended: **1-851.3-LME (1.07; Below Franklin Avenue), 1-849.5-RME (1.03; Below Lake Street)** and **1-848.5-LME (1.02)**. Site 1-853.1-RMP (1.01) was recommended because of historical past use of the site for dredged material placement and adequate capacity to handle all materials dredged from pool 1. The three emergency sites were recommended because of the need for suitable hydraulic placement areas for emergency channel closure dredging. Descriptions of the existing conditions and site development impacts for the GREAT I recommended sites are provided in Volume 8 of the Technical Appendices of the GREAT I study. These impacts are summarized below.

B-2.2.2 CMMP

In subsequent planning for implementation of the GREAT I plan, an additional site suited for placement of dredged material, Site 1-853.2-LMP (1.01A; Pool 1 Site), was evaluated. Based on

past dredging experience in pool 1, only two emergency sites were determined to be necessary for this pool. The CMMP selected Site **1-853.2-LMP (1.01A; Pool 1 Site)** for permanent placement of dredged material from pool 1. Site 1-853.2-LMP (1.01A; Pool 1 Site) was selected because of the site's previous use for dredged material stockpiling and the minimal impacts of continued use of the site (impacts summarized below). Because Site 1-853.2-LMP (1.01A; Pool 1 Site) can only be used for placement of material mechanically dredged and barged to the site, temporary/emergency sites capable of accepting hydraulically dredged materials are necessary. The sites selected under the CMMP are **1-851.3-LME (1.07; Below Franklin Avenue)** and **1-849.5-RME (1.03; Below Lake Street)**. Descriptions of the existing conditions and proposed developments at these sites are provided in TAB 10 of the CMMP. The environmental impacts of dredged material placement at the CMMP selected sites are summarized below. For additional detail on the impacts of the GREAT I plan and CMMP, the reader should refer to Section 5.0 of this EIS, the GREAT I EIS, the Section 404(b)(1) Evaluation (see Appendix D) and the Biological Assessment (see Appendix C).

B-2.2.3 Impacts of Site Use

1-853.1-RMP (1.01) - GREAT I recommended primary site

Site 1-853.1-RMP (1.01) is a disturbed upland site owned by the City of Minneapolis. The site is part of the West River Parkway system. Vegetation on-site consists primarily of mowed grass and ornamental plantings.

Acreage affected under GREAT I = 3.5 acres of disturbed terrestrial habitat

a. Little or no impacts on fish and wildlife resources.
b. No water quality impacts (mechanical placement only).
c. No assessment of impacts on threatened and endangered species completed.
d. Potential for adverse floodplain impacts if material is not removed before seasonal high water.
e. Site is part of West River Parkway system, potentially part of Great River Road; substantial adverse impacts on recreational resources if site used.
f. Low potential for cultural resource impacts. Site approved for use by MNSHPO on 24 February 1983.
g. Substantial adverse impact on social environment resulting from disruption of recreational corridor.
h. Anticipated beneficial use of materials is high; 100 percent removal projected.
i. Minor to substantial adverse impacts on aesthetic environment (visual intrusion in park-like setting).

1-853.2-LMP (1.01A; Pool 1 Site) - CMMP selected site

Site 1-853.2-LMP (1.01A; Pool 1 Site) is located under the I-35W bridge adjacent to the main channel. The site is owned by the City of Minneapolis and is an existing dredged material stockpile site.

Acreage affected under CMMP = 2 acres of disturbed terrestrial habitat.

a. Little or no impacts on fish and wildlife resources.
b. No water quality impacts (mechanical disposal only).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. No adverse floodplain impacts.
e. No recreation impacts.
f. Low potential for cultural resource impacts. Site approved for use by MNSHPO on 27 September 1984.
g. No appreciable social impacts.
h. Anticipated beneficial use of materials is high; 100 percent removal projected.
i. No appreciable impacts on aesthetics.

1-851.3-LME (1.07; Below Franklin Avenue) - GREAT I recommended emergency, CMMP selected emergency

Site 1-851.3-LME (1.07; Below Franklin Avenue) is an upland site adjacent to the main channel just downstream from the Franklin Avenue bridge. It has been used for dredged material disposal in the past and is in various stages of revegetation. The site is within the floodplain and floodway.

Acreage affected under GREAT I = 11.5 acres of recreational beach/old dredged material.
Acreage affected under CMMP = 5 acres of old dredged material.

a. Little or no impacts on fish and wildlife resources under both plans
b. Minor water quality impacts associated with hydraulic placement and resulting effluent.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse floodplain impacts (site is with the floodplain and floodway).
e. Minor benefits to recreation resulting from maintenance of an open sandy beach area.
f. Low potential for cultural resource impacts. Site approved for use by MNSHPO on 27 September 1984.
g. No appreciable social impacts; minor benefits to recreational resources.
h. No beneficial use removal (site used for emergency disposal).
i. Minor adverse impacts on aesthetics (visual intrusion of dredged sand pile).

1-849.5-RME (1.03; Below Lake Street) - GREAT I recommended emergency, CMMP selected emergency

Site 1-849.5-RME (1.03; Below Lake Street) is an upland site adjacent to the main channel just downstream of the Lake Street bridge. The site has been used for dredged material disposal in the past. While some vegetation exists on-site, the majority of the area is covered with sand. The site lies within the floodplain and floodway.

Acreage affected under GREAT I = 6 acres of recreational beach/old dredged material.
Acreage affected under CMMP = 4 acres of old dredged material.

a. Little or no impacts on fish and wildlife resources under both plans.
b. Minor water quality impacts associated with hydraulic placement and resulting effluent.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. Minor benefits to recreation resulting from maintenance of an open sandy beach area.
f. Low potential for cultural resource impacts. Site approved for use by MNSHPO on 27 September 1984.
g. No appreciable social impacts; minor benefits to recreational resources.

1-848.5-LME (1.02) - GREAT I recommended emergency

Site 1-848.5-LME (1.02) is an upland site adjacent to the main channel just upstream of Lock and Dam 1. The site has been used for dredged material disposal in the past and is sparsely vegetated by grasses and shrubs. The site is within the floodway.

Acreage affected under GREAT I = 4.5 acres of recreational beach/old dredged material.

a. Little or no impacts on fish and wildlife resources.
b. Minor water quality impacts associated with hydraulic placement and resulting effluent.
c. No assessment of impacts on threatened and endangered species.
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. Minor benefits to recreation resulting from maintenance of an open sandy beach area.
f. Low potential for cultural resource impacts. Site approved for use by MNSHPO on 24 February 1983.
g. Adverse social impacts as site attracts recreational use, creating a localized traffic hazard.
h. No beneficial use removal (site used for emergency disposal).
i. No adverse impacts on aesthetics (visual qualities of site already disturbed by existing dredged sand deposits).

B-2.2.4 Comparison of Plans

Neither the GREAT I nor the CMMP plan would have significant adverse water quality impacts (Tables B-5 and B-6). In terms of permanent placement sites, neither alternative would have any adverse effect on fish and wildlife resources (Tables B-5 and B-6). The CMMP would have less overall effect as only two sites are designated as emergency placement sites (totaling 9 acres of old dredged material), as compared to the GREAT I plan which designates three sites totaling 22 acres as emergency sites.

The Minnesota SHPO has approved using all of the sites. Expansion beyond the boundaries of any previously used site or beyond the previously used portion of any site would require coordination with the Minnesota SHPO. As the SHPO has approved all the sites, there is no significant difference between the CMMP and GREAT plans (Tables B-5 and B-6).

Use of Site 1-853.1-RMP (1.01), as proposed by GREAT I, would have substantial adverse impacts on recreational resources by disrupting the recreational corridor along the west side of the river. Additionally, the visual intrusion of a dredged sand pile in a park-like setting would substantially affect the aesthetic qualities of the area.

Table B-5. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

POOL 1 - GREAT

	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values				X			
3. Recreational Opportunities			X			X	
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use				X			
10. Controversy				X			
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services		X					
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply				X			
8. Commercial Navigation			X				
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands				X			
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion				X			
6. Biological Productivity				X			
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				U*			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				X			

* U = undefined or undetermined for the current stage of planning.

Table B-6. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

POOL 1 - CMMP

	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values				X			
3. Recreational Opportunities			X		X		
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use				X			
10. Controversy				X			
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services		X					
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply				X			
8. Commercial Navigation			X				
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands				X			
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion				X			
6. Biological Productivity				X			
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				X			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				X			

B-3.0 MINNESOTA RIVER

B-3.1 SITE-SPECIFIC IMPACTS OF DREDGING

B-3.1.1 GREAT I Channel Maintenance Plan

Placement sites were recommended for five dredge cuts in the Minnesota River pool (Table B-7). A projected quantity of 722,000 cubic yards of dredged material would be removed from these cuts over the 40-year planning horizon.

B-3.1.2 CMMP

Placement site planning was completed for the same dredge cuts identified by GREAT I; however, the Peterson's Bar cut was separated into three cuts to facilitate planning for dredged material placement (Table B-7). A projected quantity of 722,000 cubic yards of dredged material would be removed from these cuts over the 40-year planning horizon.

Table B-7. Dredge cuts, Minnesota River.

Pool-Cut #	Cut Name	Location (RM)	GREAT I Status	CMMP Status
MN-5	Above Savage Railroad Bridge	14.3 to 14.7	Active	Active
MN-4	Cargill Slip	12.8 to 13.6	Active	Active
MN-3C*	Peterson's Bar	11.8 to 12.4	Active	Active
MN-3B*	Below Peterson's Bar	11.0 to 11.6	Active	Active
MN-3A*	Above 35W Bridge	10.1	Active	Active
MN-2	4-Mile Cutoff	4.0	Active	Active
MN-1	Mouth of the Minnesota River	0.0 to 0.5	Active	Active

* The Peterson's Bar, Below Peterson's Bar and Above 35W Bridge cuts were considered one cut under GREAT I.

B-3.1.3 Impacts of Dredging

Over the 40-year planning period, an estimated 722,000 cubic yards of material would be dredged from the Minnesota River under both plans. The impacts of dredging the Minnesota River cuts are summarized below.

Acreage affected under GREAT I = 37.6 acres of main channel habitat.
Acreage affected under CMMP = 37.6 acres of main channel habitat.

a. Minor impacts on benthic invertebrates and fish.
b. Sediments are contaminated; minor to substantial impacts on water quality.

c. Freshwater mussels once extirpated now recovering in Minnesota River; minor adverse effects on this resource.
d. No determination of the effects of dredging cuts MN-3A and MN-2 on Federal threatened or endangered species (mussel survey and coordination required; see Appendix C). No adverse impacts on Federal threatened or endangered species from dredging remaining active cuts.
e. Short-term displacement of recreational craft; minor or negligible effect.
f. Unknown if cultural resources would be affected; cultural resources review to identify potential shipwrecks should be completed.
g. No appreciable social impacts.

B-3.1.4 Comparison of Plans

Neither of the alternative plans would be expected to have any significant adverse water quality impacts (Tables B-8 and B-9). However, the sediments of the Minnesota River are moderately contaminated. Resuspension of sediments during the dredging process could result in minor adverse impacts on water quality under both plans. From a water quality perspective, hydraulic dredging would be preferable.

The CMMP would likely not affect Federal threatened and endangered species (Table B-9), however, two dredge cuts must be surveyed for threatened or endangered mussel species and the results of surveys coordinated with the USFWS to confirm this determination. The impacts of the GREAT I plan on threatened and endangered species have not been assessed (Table B-8).

B-3.2 SITE-SPECIFIC IMPACTS OF DREDGED MATERIAL PLACEMENT

B-3.2.1 GREAT I Channel Maintenance Plan

The GREAT I study evaluated a number of sites in the Minnesota River pool. The evaluation of impacts of use of all alternative sites considered under GREAT I as well as justification for recommending placement sites for the Minnesota River is provided on pages 96-98 of the GREAT I EIS (Volume 9 of the GREAT I Technical Appendices) and incorporated by reference in this document. The GREAT I plan for the Minnesota River recommended five sites for placement of dredged materials: **MN-13.5-RMP (MN.03; Cargill)**, **MN-11.4-RMP (MN.30)**, **MN-4.5-RMP (MN.28)**, **MN-12.0-RMP (MN.06)**, and **2-843.3-RMP (2.18)**. With the exception of MN-12.0-RMP (MN.06), all sites were recommended as primary sites. Site MN-12.0-RMP (MN.06) was recommended as a secondary site. Although, GREAT I recommended these sites, further analysis indicates only four sites would be necessary for containment of projected quantities. The four sites most likely used if the GREAT I alternative were implemented include: MN-13.5-RMP (MN.03; Cargill), MN-11.4-RMP (MN.30), MN-4.5-RMP (MN.28) and 2-843.3-RMP (2.18). Descriptions of the existing conditions and site development impacts for the recommended GREAT I sites are provided in Volume 8 of the Technical

Appendices of the GREAT I study. The impacts of using the sites selected by GREAT I are summarized below.

B-3.2.2 CMMP

In subsequent planning for implementation of the GREAT I plan, five additional sites suited for placement of dredged materials from the Minnesota River were evaluated: MN-14.8-RMP (Continental Grain), MN-12.1-RMP (Kraemer Site), MN-10.1-RMP (NSP Site), MN-7.3-RMP (Highway 77 Bridge) and 2-840.4-RMP (2.16; Highbridge). As the local sponsor, the Lower Minnesota River Watershed District is responsible for providing placement sites. For the most part, the sites selected under the CMMP are sites identified by the local sponsor. Additionally, no unacceptable environmental impacts would result from use of the selected sites. The CMMP selected **MN-13.5-RMP (MN.03; Cargill), MN-12.1-RMP (Kraemer Site), MN-10.1-RMP (NSP Site), MN-7.3-RMP (Highway 77 Bridge)** and **2-840.4-RMP (2.16; Highbridge)** for placement of materials dredged from the Minnesota River. Descriptions of the existing conditions and proposed developments at these sites are provided in TAB 9 of the CMMP. The impacts of dredged material placement at the CMMP selected sites are summarized below. For additional detail on the impacts of the GREAT I plan and CMMP, the reader should refer to Section 5.0 of this EIS, the GREAT I EIS, the Section 404(b)(1) Evaluation (see Appendix D) and the Biological Assessment (see Appendix C).

B-3.2.3 Impacts of Site Use

MN-14.8-RMP (Continental Grain) - considered, but not selected for CMMP

Site MN-14.8-RMP (Continental Grain) is an existing dredged material placement site located near the Continental Grain terminal.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, approximately 1 acre of disturbed terrestrial habitat was considered for dredged material placement.

a. Little or no impacts on fish and wildlife resources.
b. Sediments contaminated; minor adverse impacts on water quality associated with hydraulic placement and resulting effluent.
c. No assessment of impacts on threatened and endangered species completed.
d. No adverse floodplain impacts.
e. No recreation impacts.
f. Low potential for cultural resource impacts. However, site must be coordinated with MNSHPO.
g. No appreciable social impacts.
h. No beneficial use removal of material projected.
i. No adverse impacts on aesthetics (visual qualities of site already disturbed by existing uses).

MN-13.5-RMP (MN.03; Cargill) - GREAT I recommended primary site, CMMP selected site

Site MN-13.5-RMP (MN.03; Cargill) is located approximately 6,000 feet south of the Minnesota River. Vegetated by grasses, sedges, herbs, and invading brush, the habitat type of Site MN-13.5-RMP is transitional between upland and wetland.

Acreage affected under GREAT I = 7 acres of type 1-2 wetlands.
Acreage affected under CMMP = 7 acres of type 1-2 wetlands.

a. Minor adverse impacts on fish and wildlife resources.
b. Sediments contaminated; minor adverse impacts on water quality associated with hydraulic placement and resulting effluent.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. No floodplain impacts (site is within the floodplain but out of the floodway).
e. No recreation impacts.
f. Low potential for cultural resource impacts; however, site must be coordinated with MNSHPO.
g. No appreciable social impacts.
h. Anticipated beneficial use of materials is high; 100 percent removal projected.
i. Minor adverse impacts on aesthetics (visual qualities of site would be disrupted by dredged sand placement).

MN-12.1-RMP (Kraemer Site) - CMMP selected site

Site MN-12.1-RMP (Kraemer Site) is an existing dredged material placement site. The site is entirely upland in character and has been disturbed by past disposal.

Acreage affected under CMMP = 5 acres of disturbed terrestrial habitat.

a. No impacts on fish and wildlife resources.
b. Sediments contaminated; minor adverse impacts on water quality associated with hydraulic placement and resulting effluent; no impacts if mechanical placement.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. No recreation impacts.
f. Low potential for cultural resource impacts; however, site must be coordinated with MNSHPO.
g. No appreciable social impacts.
h. Anticipated beneficial use of materials is high; 100 percent removal projected.
i. Minor adverse impacts on aesthetics (visual intrusion of dredged sand pile on riparian shoreline).

MN-12.0-RMP (MN.06) - GREAT I recommended secondary site

Site MN-12.0-RMP (MN.06) is a 24-acre area lying 2,500 feet from the Minnesota River on the right bank. The site is low-lying and has been disturbed by an adjacent gravel mining operation. The site is identified as disturbed meadow habitat.

Acreage affected under GREAT I = although recommended by GREAT I, this site would not be required because adequate capacity is available at the other selected sites, however, 24 acres of disturbed meadow (no wetlands) were identified under GREAT I.

a. Minor fish and wildlife impacts.
b. No appreciable water quality impacts.
c. No assessment of impacts on threatened and endangered species.
d. Potential adverse floodplain impacts (site is within the floodplain but out of the floodway).
e. No recreation impacts.
f. Cultural resource survey required before use.
g. No appreciable social impacts.
h. Anticipated beneficial removal low.
i. Minor adverse impacts on aesthetics (visual intrusion).

MN-11.4-RMP (MN.30) - GREAT I recommended primary site

Site MN-11.4-RMP (MN.30) is an active limestone quarry located approximately 5,000 feet south of the Minnesota River.

Acreage affected under GREAT I = 32.5 acres of open water aquatic habitat and 32.5 acres of abandoned quarry upland habitat; 65 acres total.

a. Minor or no fish and wildlife impacts.
b. Quarry placement would have no effect on water quality.
c. No assessment of impacts on threatened and endangered species.
d. No floodplain impacts (site is out of the floodplain and floodway).
e. No recreation impacts.
f. Low potential for cultural resource impacts; however, site must be coordinated with MNSHPO.
g. No appreciable social impacts.
h. No beneficial use removal projected.
i. No impacts on aesthetics (visual qualities of site already disturbed by existing uses).

MN-10.1-RMP (NSP Site) - CMMP selected site

Site MN-10.1-RMP (NSP Site) is located in a disturbed old field adjacent to the access road to the Black Dog generating station. The site is within the floodplain, but upland in character.

Acreage affected under CMMP = 7 acres of disturbed terrestrial habitat.

a. Minor impacts on fish and wildlife resources.
b. Site used only for mechanical placement; no effects on water quality.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. No adverse impacts on floodplain functions.
e. No recreation impacts.
f. Low potential for cultural resource impacts; however, site must be coordinated with MNSHPO.
g. No appreciable social impacts.
h. Anticipated beneficial use of materials is high; 100 percent removal projected.
i. Minor adverse impacts on aesthetics (visual intrusion).

MN-7.3-RMP (Highway 77 Bridge) - CMMP selected site

The exact dimensions and location of Site MN-7.3-RMP (Highway 77 Bridge) have yet to be determined, however, it appears the final placement site will be located in a former agricultural field immediately downstream of the Highway 77 bridge. The site is owned by the Minnesota Department of Natural Resources and is entirely upland in nature.

Acreage affected under the CMMP = 4 acres of agricultural field habitat.

a. No impacts on fish and wildlife resources.
b. No significant effects on water quality.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. No impacts on floodplain functions.
e. Minor adverse recreation impacts (may be conflicts with use of boat ramp and would conflict with use of bike path).
f. High potential for cultural resource impacts; site must be coordinated with MNSHPO.
g. No appreciable social impacts.
h. Anticipated beneficial use of materials is high; 100 percent removal projected.
i. No adverse impacts on aesthetics (visual qualities of site already disturbed by existing site use).

MN-4.5-RMP (MN.28) - GREAT I recommended primary site

Site MN-4.5-RMP (MN.28) is located on a 100-acre island created by a cutoff channel at RM 4.4. The site has been used in the past for dredged material disposal and is vegetated by grasses and pioneering shrubs and trees. The remainder of the island is bottomland hardwood habitat.

Acreage affected under GREAT I = 18 acres of disturbed terrestrial habitat.

a. Minor adverse effects on fish and wildlife resources.
b. Site used only for mechanical placement; no effect on water quality.
c. No assessment of impacts on threatened and endangered species.
d. Minor adverse floodplain effects (site is within the floodplain and floodway).
e. Potential recreation benefits from use of the site by river recreationists.
f. Low potential for cultural resource impacts; however, site must be coordinated with MNSHPO.
g. No appreciable social impacts; benefits to recreation.
h. Anticipated beneficial use of material is low; no removal projected.
i. Minor adverse impacts on aesthetics.

2-843.3-RMP (2.18) - GREAT I recommended primary site

Site 2-843.3-RMP (2.18) is located at a commercial sand and gravel stockpile site owned by the J.L. Shiely Company. Dredged material placed at this site would be used by J.L. Shiely Company as part of its sand and gravel operation. The site is bounded by the river, two roads and a disturbed wetland.

Acreage affected under GREAT I = no land would be affected since all materials would be removed from barges by a private company and placed elsewhere.

a. No adverse fish and wildlife effects.
b. Site used only for mechanical placement; no effect on water quality.
c. No assessment of impacts on threatened and endangered species.
d. No floodplain impacts (site is out of the floodplain and floodway).
e. No recreation impacts.
f. Very low potential for cultural resource impacts; however, site must be coordinated with MNSHPO.
g. No appreciable social impacts.
h. Anticipated beneficial use of material is high; 100 percent removal projected.
i. No adverse impacts on aesthetics (visual qualities of site already disturbed by existing uses).

2-840.4-RMP (2.16; Highbridge) - GREAT I recommended primary site; CMMP selected site

Site 2-840.4-RMP (2.16; Highbridge) is located adjacent to the St. Paul small-boat harbor and owned by the City of St. Paul. The site has been used for dredged material stockpiling in the past and is sparsely vegetated.

Acreage affected under GREAT I = 3.4 acres of disturbed terrestrial habitat.
Acreage affected under CMMP = 4 acres of disturbed terrestrial habitat.

a. Little or no effect on fish and wildlife resources under both plans.
b. Sediments contaminated; minor adverse impacts on water quality associated with hydraulic placement and resulting effluent; no impacts if mechanical placement.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Potential floodplain impacts (site is within the floodplain but out of the floodway).
e. Area is the location of a potential trail linkage between Lilydale Regional Park and Harriet Island Regional Park; minor adverse impacts on recreation from site use.
f. Low potential for cultural resource impacts; however, site must be coordinated with MNSHPO.
g. Substantial social impacts; adverse impacts on recreation; public safety concern associated with residence located 800 feet from site and marina located 300 feet from site.
h. Anticipated beneficial use of material high; 100 percent removal projected.
i. No adverse impacts on aesthetics (site is already highly disturbed).

B-3.2.4 Comparison of Plans

Neither of the alternative plans would be expected to have any significant adverse water quality impacts (Tables B-8 and B-9). However, from a water quality perspective, the alternative that maximizes mechanical placement would be preferred. A substantially larger volume of dredged material would be mechanically handled under the CMMP. Short-term water quality impacts would be reduced under the CMMP due to increased use of mechanical dredging, however, the long-term effects of both plans would not be appreciably different.

Not including Site 2-843.3-RMP (2.18), under the GREAT I plan approximately 7 acres of bottomland forest, 32.5 acres of open water aquatic, 32.5 acres of abandoned quarry, and 18 acres of disturbed terrestrial habitat would be converted to bare sand. Comparable figures for the CMMP, not including Site 2-840.4-RMP (2.16; Highbridge), include 7 acres of bottomland forest, 4 acres of agricultural field and 12 acres of disturbed terrestrial habitat. [Note: While Sites 2-843.3-RMP (2.18) and 2-840.4-RMP (2.16; Highbridge) would be used for placement of materials from the Minnesota River dredge cuts under the GREAT I plan and CMMP, respectively, the primary use of these sites would be for placement of materials from cuts in pool 2. Thus, the acres affected at these sites are considered and included in the impacts for the pool 2 plans.] The CMMP would affect substantially fewer acres in total and would affect no aquatic acres. The absolute affects of the CMMP on fish and wildlife habitats would be less than those

of the GREAT I plan, however, the relative effects of both plans on the productivity of the Minnesota River would be minor (Tables B-8 and 9). The CMMP would not affect Federal threatened and endangered species (Table B-9), while the impacts of the GREAT I plan on threatened and endangered species have not been assessed (Table B-8).

The literature search and records review for submerged shipwrecks did not include that portion of the 9-foot navigation channel along the Minnesota River. Dredging to maintain existing channels should be reviewed to consider the potential for unknown shipwrecks along the Minnesota River. While many of the sites above would probably not affect cultural resources, all selected sites in the Minnesota River pool should be coordinated with the Minnesota SHPO. Any currently approved site that the District plans to expand would have to be coordinated with the SHPO as well.

No appreciable socioeconomic impacts have been identified for either plan (Tables B-8 and B-9). Neither alternative would have adverse effects on the Minnesota Valley Fish and Wildlife Refuge. The GREAT I alternative would use Site MN-4.5-RMP (MN.28) for placement of dredged material, while the CMMP would use Site MN-7.3-RMP (Highway 77 Bridge). The impacts on Fort Snelling State Park would be greater under the GREAT I alternative than under the CMMP; however, these impacts would be minor.

Table B-8. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

MINNESOTA RIVER - GREAT

	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values					X		
3. Recreational Opportunities				X			
4. Transportation		X					
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development			X				
8. Business and Home Relocations				X			
9. Existing/Potential Land Use					X		
10. Controversy					X		
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services				X			
4. Regional Growth				X			
5. Employment			X				
6. Business Activity			X				
7. Farmland/Food Supply			X				
8. Commercial Navigation	X						
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands					X		
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				U*			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

Table B-9. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

MINNESOTA RIVER - CMMP

PARAMETER	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE EFFECT	ADVERSE EFFECT		
	SIGNIFICANT	SUBSTANTIAL	MINOR		MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values					X		
3. Recreational Opportunities				X			
4. Transportation		X					
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development			X				
8. Business and Home Relocations				X			
9. Existing/Potential Land Use					X		
10. Controversy					X		
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services				X			
4. Regional Growth				X			
5. Employment			X				
6. Business Activity			X				
7. Farmland/Food Supply			X				
8. Commercial Navigation	X						
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands					X		
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				X			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

B-4.0 POOL 2

B-4.1 SITE-SPECIFIC IMPACTS OF DREDGING

B-4.1.1 GREAT I Channel Maintenance Plan

Placement sites were recommended for 10 dredge cuts in pool 2 (Table B-10). A projected quantity of 4,136,000 cubic yards of dredged material would be removed from these cuts over the 40-year planning horizon.

B-4.1.2 CMMP

Placement site planning was completed for the same dredge cuts identified by GREAT I; however, based on historical dredging patterns and current criteria for implementing maintenance dredging, the Harriet Island, Lower Approach to L/D 1, Upper Approach to L/D 2 and Below Cudahy cuts would not be maintained (i.e., considered inactive). The Grey Cloud Slough cut was divided into two separate cuts to facilitate material placement planning (Table B-10). A projected quantity of 3,742,000 cubic yards of dredged material would be removed from the active cuts over the 40-year planning period.

Table B-10. Dredge cuts, Pool 2.

Pool-Cut #	Cut Name	Location (RM)	GREAT I Status	CMMP Status
2-10	Lower Approach to L/D 1	847.7 to 848.4	Active	Inactive
2-9	Above and Below Smith Avenue	840.0 to 841.3	Active	Active
2-8	Harriet Island	838.4 to 839.7	Active	Inactive
2-7	St. Paul Barge Terminal	836.4 to 837.8	Active	Active
2-6	Below Cudahy	831.0 to 832.4	Active	Inactive
2-5B*	Grey Cloud Slough	827.5 to 828.3	Active	Active
2-5A*	Robinson Rocks	826.1	Active	Active
2-4	Pine Bend	822.7 to 823.7	Active	Active
2-3	Boulanger Bend	820.7 to 821.4	Active	Active
2-2	Boulanger Bend Lower Light	819.0 to 819.8	Active	Active
2-1	Upper Approach to L/D 2	815.5 to 815.9	Active	Inactive

* The Grey Cloud Slough and Robinson Rocks cuts were considered one cut under GREAT I.

B-4.1.3 Impacts of Dredging

Over the 40-year planning period, an estimated 4,136,000 cubic yards of material would be dredged from pool 2 under the GREAT I plan. An estimated 3,742,000 cubic yards would be dredged under the CMMP. A summarization of the impacts of dredging in pool 2 is provided below.

Acreage affected under GREAT I = 347.9 acres of main channel habitat.
Acreage affected under CMMP = 241.2 acres of main channel habitat.

a. Substantial adverse impacts on main channel habitat, benthic invertebrates and fish.
b. Sediments contaminated fine to medium sands; minor impacts on water quality.
c. Impoverished but recovering freshwater mussel fauna; anticipated effect is minor.
d. No determination of the effects of dredging cut 2-5A on Federal threatened or endangered species (mussel survey/coordination required; see Appendix C). No adverse impact on Federal threatened or endangered species from dredging remaining active cuts.
e. Short-term displacement of recreational craft; minor or no effect.
f. No cultural resources affected.
g. No appreciable social impacts.

B-4.1.4 Comparison of Plans

Under the GREAT I plan, 9.9 miles of main channel would be dredged, while under the CMMP, 6.1 miles of main channel would be maintained. GREAT I would affect about 106 more acres of main channel habitat than the CMMP.

Neither plan would have significant adverse water quality impacts (Tables B-11 and B-12). Both plans would utilize a combination of hydraulic and mechanical dredging. Comparatively, the impacts of dredging on water quality under both plans would be indistinguishable.

The effects of the GREAT I plan on threatened and endangered species have not been assessed (Table B-11). The CMMP would likely have no effect on Federal threatened and endangered species (Table B-12), however, one dredge cut must be surveyed for freshwater mussels and the results coordinated with the USFWS to confirm this determination.

B-4.2 SITE-SPECIFIC IMPACTS OF DREDGED MATERIAL PLACEMENT

B-4.2.1 GREAT I Channel Maintenance Plan

The GREAT I study evaluated a number of potential placement sites for materials dredged from pool 2. The evaluation of impacts of use of all alternative sites considered under GREAT I as well as justification for recommending placement sites for pool 2 is provided on pages 99-102 of the GREAT I EIS (Volume 9 of the GREAT I Technical Appendices) and incorporated by reference in this document. The GREAT I plan for pool 2 recommended use of the following sites as primary sites in pool 2: **2-843.3-RMP (2.18), 2-841.3-LMP (2.37), 2-840.4-RMP (2.16; Highbridge), 2-836.8-RMP (2.14; Holman Field), 2-832.5-RMP (2.10; Armour Site), 2-821.0-LMP (2.35; Lower Grey Cloud Island Field)** and **2-815.4-RMP (2.30)**. Site **2-838.2-RMP (2.15; Northport)** was recommended as a secondary site because of limited capacity and uncertain future availability. Sites **2-836.3-RMP (2.13; Southport), 2-837.5-RMP (2.40; St. Paul Barge Terminal)** and **2-837.2-LMP (2.02)** were recommended as tertiary sites,

respectively. Although GREAT I recommended all these sites for placement of materials from pool 2, further analysis of projected dredged material quantities indicates not all the recommended sites would be necessary. The sites most likely used if the GREAT I plan were implemented include: 2-843.3-RMP (2.18), 2-841.3-LMP (2.37), 2-840.4-RMP (2.16; Highbridge), 2-837.5-RMP (2.40; St. Paul Barge Terminal), 2-836.3-RMP (2.13; Southport), 2-832.5-RMP (2.10; Armour Site), 2-821.0-LMP (2.35; Lower Grey Cloud Island Field) and 2-815.4-RMP (2.30). Descriptions of the existing conditions and site development impacts for the selected GREAT I sites are provided in Volume 8 of the Technical Appendices of the GREAT I study. These impacts are summarized below.

B-4.2.2 CMMP

Subsequent planning for implementation of the GREAT I plan revealed that sites 2-838.2-RMP (2.15; Northport) and 2-837.2-LMP (2.02) were no longer viable because of site development. Additionally, based on historical dredging patterns and current criteria for implementing maintenance dredging, the Harriet Island, Lower Approach to L/D 1, Upper Approach to L/D 2 and Below Cudahy cuts were placed on the inactive list (i.e., would not be maintained). This obviated the need for Sites 2-843.3-RMP (2.18) and 2-815.4-RMP (2.30). Several new sites were identified and evaluated as placement sites: 2-827.2-RMP (2.27; Grey Cloud Slough), 2-823.8-RMP (C.F. Industries), 2-822.5-LMP (Shiely Pit), 2-821.5-LMT (Upper Boulanger Island) and 2-821.1-LMT (2.31A; Lower Boulanger Island). Finally, two sites originally evaluated by GREAT I were reassessed as potential sites: 2-823.8-LMT (2.25; Pine Bend) and 2-822.0-RMP (2.24; Spring Lake). The impacts of using all these sites are summarized below. The CMMP selected the following permanent sites for placement of materials from pool 2: **2-840.4-RMP (2.16; Highbridge)**, **2-837.5-RMP (2.40; St. Paul Barge Terminal)**, **2-836.8-RMP (2.14; Holman Field)**, **2-836.3-RMP (2.13; Southport)**, **2-823.8-RMP (C.F. Industries)** and **2-822.5-LMP (Shiely Pit)**. Three transfer sites were also selected: **2-823.8-LMT (2.25; Pine Bend)**, **2-821.5-LMT (Upper Boulanger Island)** and **2-821.1-LMT (2.31A; Lower Boulanger Island)**. Descriptions of the existing conditions and proposed developments at these sites are provided in TAB 11 of the CMMP. The impacts of dredged material placement at these sites are summarized below. For additional detail on the impacts of the GREAT I plan and CMMP, the reader should refer to Section 5.0 of this EIS, the GREAT I EIS, the Section 404(b)(1) Evaluation (see Appendix D) and the Biological Assessment (see Appendix C).

B-4.2.3 Impacts of Site Use

2-843.3-RMP (2.18) - GREAT I recommended primary site

Site 2-843.3-RMP (2.18) is a commercial sand and gravel stockpile site owned by the J.L. Shiely Company. Dredged material placed at this site would be used by J.L. Shiely Company as part of its sand and gravel operation. The site is bounded by the river, two roads and a disturbed wetland.

Acreage affected under GREAT I = no land would be affected since all materials would be removed from barges by a private company and placed elsewhere.

a. No adverse fish and wildlife impacts.
b. Site used only for mechanical placement; no effect on water quality.
c. No assessment of impacts on threatened and endangered species.
d. No floodplain impacts (site is out of the floodplain and floodway).
e. No recreation impacts.
f. Very low potential for cultural resource impacts; however, site must be coordinated with MNSHPO.
g. No appreciable social impacts.
h. Anticipated beneficial use of material high; 100 percent removal projected.
i. No adverse impacts on aesthetics (visual qualities of site already highly disturbed).

2-841.3-LMP (2.37) - GREAT I recommended primary site

Site 2-841.3-LMP (2.37) is located in an abandoned fly ash pit owned by Northern States Power Company. The site is part of a retired electrical generating station and is highly disturbed.

Acreage affected under GREAT I = 7 acres of disturbed terrestrial habitat.

a. No appreciable fish and wildlife resource impacts.
b. Sediments contaminated; minor and temporary adverse impacts on water quality associated with hydraulic placement and resulting effluent (State effluent standards would likely be exceeded); no water quality impacts if mechanical placement.
c. No assessment of impacts on threatened and endangered species.
d. Site is within the floodplain but out of the floodway; potential minor floodplain impacts.
e. No recreation impacts.
f. Low potential for cultural resource impacts; however, site must be coordinated with MNSHPO.
g. Minor social impacts; safety concern associated with residence located 1,000 feet from site.
h. High beneficial use demand projected; 100 percent removal anticipated.
i. No adverse impacts on aesthetics (visual qualities of site already highly disturbed).

2-840.4-RMP (2.16; Highbridge) - GREAT I recommended primary site, CMMP selected site

Site 2-840.4-RMP (2.16; Highbridge) is located adjacent to the St. Paul small-boat harbor and owned by the City of St. Paul. The site has been used for dredged material stockpiling in the past and is sparsely vegetated. The site is located within the floodplain but out of the floodway. A stockpile exists on site with adjacent land uses including a barge repair facility, a small-boat harbor and a county road.

Acreage affected under GREAT I = 3.4 acres disturbed terrestrial habitat.

Acreage affected under CMMP = 4 acres disturbed terrestrial habitat.

a. Little or no effect on fish and wildlife resources under both plans.
b. Sediments contaminated; minor adverse impacts on water quality associated with hydraulic placement and resulting effluent; no impacts if mechanical placement.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Site is within the floodplain but out of the floodway; potential floodplain impacts.
e. Area is the location of a potential trail linkage between Lilydale Regional Park and Harriet Island Regional Park; minor adverse impacts on recreation from site use.
f. Low potential for cultural resource impacts; however, site must be coordinated with MNSHPO.
g. Substantial social impacts; adverse impacts on recreation; public safety concern associated with residence located 800 feet from site and marina located 300 feet from site.
h. Anticipated beneficial use of material high; 100 percent removal projected.
i. No adverse impacts on aesthetics (site is already highly disturbed).

2-838.2-RMP (2.15; Northport) - GREAT I recommended secondary site; CMMP selected site

Site 2-838.2-RMP (2.15; Northport) is located on the north end of Holman Field. The site is highly disturbed and has already been used for dredged material placement under the CMMP. Because of past use and airport expansion plans, this site has no or very limited capacity.

Acreage affected under GREAT I = 5.5 acres of disturbed terrestrial habitat.
Acreage affected under CMMP = 6 acres of disturbed terrestrial habitat.

a. Little or no effect on fish and wildlife resources.
b. Sediments contaminated; potential for substantial adverse impacts on water quality associated with hydraulic placement and resulting effluent.
c. No adverse impacts on Federal threatened and endangered species.
d. No floodplain impacts.
e. No recreation impacts.
f. No cultural resource impacts.
g. No appreciable social impacts.
h. Material available for beneficial use removal.
i. No adverse impacts on aesthetics (site is already highly disturbed).

2-837.5-RMP (2.40; St. Paul Barge Terminal) - GREAT I recommended fourth priority site, CMMP selected site

Site 2-837.5-RMP (2.40; St. Paul Barge Terminal) is an open water site located on the inside of the river bend. The site would be converted from river bottom to fast land, using a sheet pile wall and dredged material. Part of the site would then be used as a dredged material beneficial use site, while the remainder would be available to the St. Paul Port Authority for development.

Acreage affected under GREAT I = 28 acres of main channel border habitat.
Acreage affected under CMMP = 28 acres of main channel border habitat.

a. Substantial adverse impacts on fish and aquatic invertebrates, use of site is opposed by Minnesota Department of Natural Resources and US Fish and Wildlife Service.
b. Sediments contaminated; potential for substantial adverse impacts on water quality associated with open water hydraulic placement (State standards likely violated); potential for minor adverse impacts associated with open water mechanical placement, use of site is opposed by Minnesota Pollution Control Agency.
c. No determination of the effects of dredged material placement on Federal threatened or endangered species (mussel survey and coordination required; see Appendix C).
d. Minor adverse floodplain impacts (site is within both the floodplain and floodway).
e. No recreation impacts.
f. Very low potential for cultural resource impacts; however, site must be coordinated with MNSHPO.
g. Minor beneficial social impacts; long-range potential for industrial development.
h. Once filled, beneficial use stockpile would be created; projected demand for material is high.
i. Substantial adverse impacts on aesthetics (natural riverbank converted to sheet pile wall would disrupt visual qualities of the area), use of site is opposed by US National Park Service (non-compatibility with Mississippi National River and Recreation Corridor).

2-837.2-LM (2.02) - GREAT I recommended fifth priority site

Site 2-837.2-LM (2.02) is a disturbed upland meadow lying approximately 1,000 feet from the UMR. The site is bounded by highways and railroads on two sides and by similar meadow habitat on the third.

Acreage affected under GREAT I = although recommended by GREAT I, this site would not be required because adequate capacity exists at the other selected sites, however, 69 acres of upland meadow habitat were identified under GREAT I.

a. Substantial adverse impacts on wildlife resources.
b. No appreciable water quality impacts.
c. No assessment of impacts on threatened and endangered species completed.
d. No floodplain impacts (site is out of the floodplain and floodway).
e. No recreation impacts.
f. Cultural resource survey required before use; site must be coordinated with MNSHPO.
g. No appreciable social impacts.
h. Material available for beneficial use removal.
i. Minor adverse impacts on aesthetics (visual qualities of site already disturbed by existing and adjacent site uses).

2-836.8-RMP (2.14; Holman Field) - GREAT I recommended primary site, CMMP selected site

Site 2-836.8-RMP (2.14; Holman Field) is the Holman Field airport near downtown St. Paul. Dredged material would be provided to the airport for use in its development activities. Material would be provided only after the airport operators acquire all Federal, State, and local permits necessary for their fill activities. Approximately 110 acres would be available for disposal of dredged materials. The site is almost entirely wetland in character, composed primarily of wet meadow and shallow marsh habitats.

Acreage affected under GREAT I = 80 acres of type 1-2 wetlands and 30 acres of type 3-4 wetlands; 110 acres of wetlands total.
Acreage affected under CMMP = 80 acres of type 1-2 wetlands and 30 acres of type 3-4 wetlands; 110 acres of wetlands total.

a. Substantial adverse impacts on fish and wildlife resources under both plans.
b. Large site limits potential water quality impacts; minor impacts anticipated.
c. No adverse impacts on Federal threatened and endangered species.
d. Site is within the floodplain but out of the floodway; minor adverse floodplain impacts anticipated.
e. No recreation impacts.
f. Low potential for cultural resource impacts. Site approved by MNSHPO on 10 February 1983.
g. Substantial benefit to socioeconomic resource resulting from airport expansion.
h. All material used on-site to benefit airport (passive beneficial use).
i. Minor adverse impacts on aesthetics (visual qualities of site disturbed by dredged material placement; adjacent site uses limit level of impacts, however).

2-836.3-RMP (2.13; Southport) - GREAT I recommended third priority site, CMMP selected site

Site 2-836.3-RMP (2.13; Southport) is located adjacent to an existing barge terminal below Holman Field. Habitat on the site is shrub wetland/wet meadow in character. The site is bounded by the barge terminal, the river and a mix of bottomland hardwood wetland and wet meadow habitats. The site is located within the floodplain.

Acreage affected under GREAT I = 18 acres of type 1-2 wetlands.
Acreage affected under CMMP = 18 acres of type 1-2 wetlands.

a. Substantial adverse impacts on fish and wildlife resources under both plans.
b. Sediments contaminated; substantial adverse water quality impacts associated with hydraulic placement and resulting effluent (State effluent standards likely violated).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Potential minor adverse floodplain impacts.
e. No recreation impacts.

f. Low potential for cultural resource impacts. Site approved by MNSHPO on 10 February 1983.
g. Once filled, site could be developed by St. Paul Port Authority; minor beneficial social effect.
h. Material used on-site beneficially (passive) and available for beneficial use removal.
i. Substantial adverse impacts on aesthetics (visual qualities of wetland site disturbed by dredged material placement; adjacent site uses limit level of impacts, however).

2-832.5-LMP (NSP Site) - considered, but not selected for CMMP

Site 2-832.5-LMP (NSP Site) is a privately owned site located near the Red Rock Industrial Park. The site is sparsely wooded with upland species and an understory of grasses and herbs. Bounded by the river, roads and industrial developments, the site is a mix of upland and wet meadow habitats.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, approximately 43 acres of upland/wet meadow habitat was considered for dredged material placement under the dredged material placement reconnaissance report for lower pool 2.

a. Substantial adverse impacts on fish and wildlife resources.
b. No appreciable water quality impacts.
c. No assessment of impacts on threatened and endangered species completed.
d. Potential minor adverse floodplain impacts.
e. No recreation impacts.
f. Low potential for cultural resource impacts. Site approved by MNSHPO on 17 June 1984.
g. Site has been developed; substantial adverse impacts if used for placement of materials.
h. Anticipated beneficial use of materials is high; 100 percent removal projected.
i. Minor adverse impacts on aesthetics.

2-832.5-RMP (2.10; Armour Site) - GREAT I recommended primary site

Site 2-832.5-RMP (2.10; Armour Site) is an industrial/commercial site located near the South St. Paul stockyards immediately upstream from the I-494 bridge. The site has been filled and was previously used as a manure disposal site. The site is vegetated by a mixture of grasses, herbaceous plants and invading woody species typical of urban areas.

Acreage affected under GREAT I = 25 acres of disturbed terrestrial habitat.

a. No impacts on fish and wildlife resources.
b. No water quality effects (mechanical placement only).
c. No assessment of impacts on threatened and endangered species completed.
d. No floodplain impacts.

e. No impact on recreation; however, the site could be part of a trail corridor connecting a proposed boat ramp downstream of the site and recreational facilities upstream.
f. Low potential for cultural resource impacts. Site approved by MNSHPO on 27 June 1984.
g. No appreciable social impacts.
h. Anticipated beneficial use of materials is high; 100 percent removal projected.
i. No adverse impacts on aesthetics (site is already disturbed).

2-827.2-RMP (Grey Cloud Slough) - considered, but not selected for CMMP

Site 2-827.2-RMP (Grey Cloud Slough) is a site located near the upstream end of Grey Cloud Island. The site is a historic dredged material disposal site; however, vegetation on site has withstood/recovered from the effects of deposition. The primary habitat on site is bottomland forest. The ostensible owner of the site is Macalester College. The site is part of an area known as the Katherine Ordway Natural Historical Study Area.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, approximately 9 acre of floodplain forest (type 1-2) was considered for dredged material placement under the dredged material placement reconnaissance report for lower pool 2.

a. Minor adverse impacts on wildlife resources.
b. Sediments contaminated; minor adverse impacts on water quality associated with hydraulic placement and resulting effluent; no impacts if mechanical placement.
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts.
e. No recreation impacts.
f. Low potential for cultural resource impacts; site must be coordinated with MNSHPO.
g. No appreciable social impacts.
h. No beneficial use removal of material projected.
i. Substantial adverse impacts on aesthetics (visual intrusion on floodplain forest setting).

2-823.8-LMT (2.25; Pine Bend) - CMMP selected transfer site

Site 2-823.8-LMT (2.25; Pine Bend) is located on a long peninsula separating Baldwin Lake from the navigation channel. The site was last used for dredged material disposal in 1995. Habitat on-site consists of a mixture of bottomland forest, recently deposited sand and old dredged material in various stages of revegetation. The back of the island is shallow marsh wetland habitat.

Acreage affected under CMMP = 8 acres of old dredged material.

a. No adverse impact on fish and wildlife resources.

b. Sediments contaminated; minor adverse impacts on water quality associated with hydraulic placement and resulting effluent; no impacts if mechanical placement.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse floodplain impacts.
e. Beneficial recreation impacts.
f. Low potential for cultural resource impacts. Site approved by MNSHPO on 6 January 1984.
g. No appreciable social impacts.
h. No beneficial use removal of material projected.
i. Minor adverse impacts on aesthetics (visual disruption of natural river setting).

2-823.8-RMP (C.F. Industries) - CMMP selected site

Site 2-823.8-RMP (C.F. Industries) includes two separate placement areas: a 1-acre previously used stockpile site near the C.F. Industries dock and a 6-acre borrow pit located approximately 2,500 feet inland from the dock. The 1-acre site is bounded by the river, the C.F. Industries dock and bottomland forest. The 6-acre pit site is upland in nature and disturbed. Vegetation on-site includes grasses, brush and a few trees.

Acreage affected under CMMP = 1 acre of old dredged material and 6 acres of disturbed terrestrial habitat; 7 acres total.

a. Little or no effects on fish and wildlife resources.
b. No water quality impacts (mechanical placement only).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Lower (1-acre) site is within the floodplain and floodway; adverse floodplain impacts.
e. No recreation impacts.
f. Low potential for cultural resource effects; however, site must be coordinated with MNSHPO.
g. No appreciable social impacts.
h. High beneficial use demand anticipated; 100 percent removal of materials projected.
i. Minor adverse impacts on aesthetics (visual intrusion on river/riparian setting).

2-822.5-LMP (Shiely Pit) - CMMP selected site

Site 2-822.5-LMP (Shiely Pit) is an active sand/gravel pit excavated by the J.L. Shiely Company on Lower Grey Cloud Island. No specific portion of the pit(s) has been identified for dredged material disposal; however, an estimated 15 acres of the quarry would be required for disposal of dredged material.

Acreage affected under CMMP = 15 acres of abandoned quarry aquatic habitat.

a. Little or no effects on fish and wildlife resources.
b. Large existing quarry site limits potential surface water quality impacts; potential adverse impacts on groundwater.

c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. No floodplain impacts.
e. No recreation impacts.
f. No cultural resource impacts.
g. No social impacts.
h. No beneficial use removal projected.
i. No adverse impacts on aesthetics (site is already highly disturbed).

2-822.0-RMP (2.24; Spring Lake) - considered, but not selected by CMMP

Site 2-822.0-RMP (2.24; Spring Lake) consists of a series of dikes that would be constructed to separate Spring Lake from the main channel of the river as part of an Environmental Management Program (EMP) project.

During the period 1989-1994, the District conducted planning efforts to develop a fish and wildlife habitat restoration plan for Spring Lake involving the use of dredged material. The following conclusions regarding Spring Lake were reached: 1) complete or near complete closure of Spring Lake from the UMR is not feasible due to potential water quality impacts and floodplain effects; therefore, the use of Spring Lake as a placement site is not possible, and 2) floodplain impacts would limit the scale of any island and/or closure construction at Spring Lake. The volumes of dredged material used would be too limited to provide a long-term dredged material placement solution for lower pool 2. Spring Lake is not a feasible site.

2-821.5-LMT (Upper Boulanger Island) - CMMP selected transfer site

Site 2-821.5-LMT (Upper Boulanger Island) is an island site in the lower lake-like portion of pool 2. The island is part of a chain of small islands lying between the navigation channel and Lower Grey Cloud Island. The island has been used for disposal of dredged materials in the past, most recently in 1994. Judging from the volumes of material placed here in the past and the hydraulic disposal procedures used, it is likely a delta of dredged material extending out underwater from the back of the island is present. The island has sparsely vegetated dredged material deposits colonized by grasses, herbs and shrubs, plus an area vegetated by willows and cottonwoods. Most of the woody vegetation is found on the island periphery.

Acreage affected under CMMP = 4 acres of old dredged material.

a. Little or no impact on fish and wildlife resources.
b. Sediments contaminated; minor adverse impacts on water quality associated with hydraulic placement and resulting effluent; no impacts if mechanical placement.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. Minor adverse recreation impacts.
f. Low potential for cultural resource impacts. Site approved by MNSHPO on 9 January 1984.

g. No appreciable social impacts.
h. No beneficial use removal of material projected.
i. No adverse impacts on aesthetics (site is already disturbed).

2-821.1-LMT (2.31A; Lower Boulanger Island) - CMMP selected transfer site

Site 2-821.1-LMT (2.31A; Lower Boulanger Island) is an island placement site which is also part of the chain of small islands described above. The site was last used for dredged material disposal in 1995. The island has sparsely vegetated dredged material deposits colonized by grasses, herbs and shrubs, plus area vegetated by willows and cottonwoods. Most of the woody vegetation is found on the island periphery. The shallow water portion of the island has probably been affected to some degree by past disposal actions. Bottom sediments are probably a mixture of old silty sand dredged material and more recently deposited silts. Based on aerial photography, what is known of lower pool 2 in terms of water quality and a site visit in 1995, it is unlikely any extensive aquatic plant beds are present at the site.

Acreage affected under CMMP = 5 acres of old dredged material and 3 acres of floodplain forest (type 1-2 wetland); 8 acres total.

a. Minor impact on fish and wildlife resources.
b. Sediments contaminated; minor adverse impacts on water quality associated with hydraulic placement and resulting effluent; no impacts if mechanical placement.
c. No adverse impacts on Federal threatened or endangered species (see Appendix C).
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. Minor adverse recreation impacts.
f. Low potential for cultural resource impacts. Site approved by MNSHPO on 9 January 1984.
g. No appreciable social impacts.
h. No beneficial use removal of material projected.
i. No adverse impacts on aesthetics.

2-820.0-LMP (2.35; Lower Grey Cloud Island Field) - GREAT I recommended primary site

Site 2-820.0-LMP (2.35; Lower Grey Cloud Island Field) is located in an old field on the lower end of Grey Cloud Island. The site is relatively flat old field vegetated by grasses. There are a few invading trees on the riverward side of the site. On the landward side, a few rows of red pine 20 to 30 feet in height serve as a windbreak.

Acreage affected under GREAT I = 25 acres of disturbed terrestrial habitat.

a. Minor adverse impact on wildlife resources.
b. Sediments contaminated; short-term and minor adverse impacts on water quality associated with hydraulic placement and resulting effluent; no appreciable water quality impacts if mechanical.

c. No assessment of impacts on threatened and endangered species completed.
d. No floodplain impacts.
e. No recreation impacts.
f. Low potential for cultural resource impacts. Site approved by MNSHPO on 27 June 1984.
g. Minor adverse social impacts; safety concerns associated with residential unit located 300 feet from site and nearby summer camp.
h. Anticipated beneficial use removal of material is moderate; projected 30 percent removal.
i. Minor adverse impacts on aesthetics (visual intrusion on old field setting).

2-819.4-RMT (Freeborn Island) - considered, but not selected by CMMP

Site 2-819.4-RMT (Freeborn Island) is a federally owned island/open water area in the lower lake-like portion of pool 2. The island formerly was used for dredged material disposal, most recently in 1974. A delta of dredged material extends out underwater around the island. The island consists of low-lying vegetated dredged material deposits colonized by grasses, herbs and shrubs, plus area vegetated by willows and cottonwoods. Most of the woody vegetation is found around the island edges. The shallow water portions of the site have probably been affected to some degree by past disposal actions. Bottom sediments are probably a mixture of old silty sand dredged material and more recently deposited silts. Based on aerial photography, what is known of lower pool 2 in terms of water quality, and a site visit in 1995, it is unlikely any extensive aquatic plant beds are present at the site.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, approximately 3 acres of old dredged material and 5 acres of open water (total of 8 acres) were considered for dredged material placement under the dredged material placement reconnaissance report for lower pool 2.

a. Minor adverse impact on fish and wildlife resources.
b. Sediments contaminated; short-term but substantial adverse impacts on water quality associated with open water hydraulic placement and resulting effluent; minor water quality impacts if open water mechanical placement.
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts.
e. Minor benefits to recreation resulting from creation of a beach area.
f. Low potential for cultural resource impacts. Site approved by MNSHPO on 9 January 1984.
g. No appreciable social effects; minor benefit to recreation.
h. No beneficial use removal projected from this island site.
i. Minor adverse impacts on aesthetics.

2-815.4-RMP (2.30) - GREAT I recommended primary site

Site 2-815.4-RMP (2.30) is a 3.5-acre area on a peninsula extending upstream from Lock and Dam 2. The site is vegetated primarily by shrubs and small to medium trees.

Acreage affected under GREAT I = 3.5 acres of type 1-2 wetlands.

a. Minor adverse impact on fish and wildlife resources.
b. Sediments contaminated; short-term and minor impacts on water quality associated with hydraulic placement and resulting effluent.
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts.
e. Minor benefits to recreation resulting from creation of sandy riparian area.
f. Cultural resource survey required; site must be coordinated with MNSHPO.
g. Minor benefits to social resources resulting from improved safety associated with use of the site as a lockage waiting area; minor benefits to recreation.
h. No beneficial use removal projected.
i. Minor adverse impacts on aesthetics.

B-4.2.4 Comparison of Plans

Neither plan would have significant adverse water quality impacts (Tables B-11 and B-12).

Most or all of the potential adverse fish and wildlife habitat effects in upper pool 2 would be associated with the placement of material from the St. Paul Barge Terminal dredge cut. Use of the recommended sites under both plans would result in the loss of wetland (floodplain forest) and open water (main channel border) habitat. Use of Holman Field would result in the eventual loss of up to 110 acres of wetlands for airport expansion. At the present time, it is not known what the ultimate extent of airport expansion may be or how many acres of wetlands may eventually be affected. Filling of wetlands associated with airport expansion would not occur until the appropriate Federal and State permits were obtained by the Holman Field management. Under both plans, the effects on fish and wildlife would be substantial (Tables B-11 and B-12).

In total, the GREAT I plan would affect approximately 21.5 acres of floodplain forest wetland, 28 acres of open water (main channel border), and 65.9 acres of disturbed terrestrial habitat. Comparable figures under the CMMP include 21 acres of floodplain forest, 28 acres of open water (main channel border), 18 acres of old dredged material, 10 acres of disturbed terrestrial and 21 acres of abandoned quarry (aquatic) habitat.

The effects of the GREAT I plan on threatened and endangered species have not been assessed (Table B-11). The CMMP would likely have no effect on threatened and endangered species (Table B-12), however, two placement sites require mussel surveys and coordination of survey results with the USFWS to confirm this determination.

Only three sites, 2-836.3-RMP (2.13; Southport), 2-836.8-RMP (2.14; Holman Field) and 2-820.0-LMP (2.35), have been approved by the MNSHPO for use. Southport and Holman Field are recommended/selected under both the CMMP and GREAT I plan for the same number of

acres under each. Site 2-820.0-LMP (2.35) is recommended under the GREAT I plan. Until all other sites have been coordinated, a reasonable comparison of alternatives cannot be made.

While more of the GREAT sites have been cleared by the SHPO, the CMMP sites would not require much more work to gain approval. In fact, the surveys requested by the SHPO for the CMMP sites may not be needed. The potential for affecting cultural resources at these sites is low. Overall, the number of acres required under each alternative is not significantly different.

SITE	GREAT	CMMP	SECTION 106 STATUS
2-843.3-RM (2.18)	X		Coordination needed
2-841.3-LM (2.37)	X		Coordination needed
2-840.4-RMP (2.16; Highbridge)	X	X	Coordination needed
2-838.2-RMP (2.15; Northport)	X	X	No further work needed
2-837.5-RMP (2.40; St. Paul Barge)	X	X	Coordination needed
2-836.8-RMP (2.14; Holman Field)	X	X	Approved
2-836.3-RMP (2.13; Southport)	X	X	Approved
2-832.5-RM (2.10)	X		No further work needed
2-823.8-LMT (2.25; Pine Bend)		X	Approved
2-823.8-RMP (C.F. Industries)		X	Survey & further coord. needed
2-822.5-LMP (Shiely Pit)		X	Survey & further coord. needed
2-821.5-LMT (Upper Boulanger)		X	No further work needed
2-821.1-LMT (2.31A; Lower Boulanger)		X	Survey & further coord. needed
2-820.0-LM (2.35)	X		Approved
2-815.4-RM (2.30)	X		Survey & further coord. needed

GREAT 10 disposal sites

5 approved
1 requires survey work and coordination (need to verify this; may not be needed)
4 require coordination

CMMP 10 disposal sites

5 approved
3 require survey work and coordination (need to verify this; may not be needed)
2 require further coordination

Table B-11. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

POOL 2 - GREAT

	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values					X		
3. Recreational Opportunities				X			
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use			X				
10. Controversy						X	
B. ECONOMIC EFFECTS							
1. Property Values			X				
2. Tax Revenues			X				
3. Public Facilities and Services			X				
4. Regional Growth				X			
5. Employment				X			
6. Business Activity			X				
7. Farmland/Food Supply			X				
8. Commercial Navigation			X				
9. Floodplain Effects					X		
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands						X	
4. Aquatic Habitat						X	
5. Habitat Diversity and Interspersion						X	
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				U*			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

Table B-12. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

POOL 2 - CMMP

PARAMETER	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values					X		
3. Recreational Opportunities				X			
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use			X				
10. Controversy						X	
B. ECONOMIC EFFECTS							
1. Property Values			X				
2. Tax Revenues			X				
3. Public Facilities and Services			X				
4. Regional Growth				X			
5. Employment				X			
6. Business Activity			X				
7. Farmland/Food Supply			X				
8. Commercial Navigation			X				
9. Floodplain Effects					X		
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands						X	
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion						X	
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils			X		X		
11. Threatened or Endangered Species				X			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

B-5.0 ST. CROIX RIVER

B-5.1 SITE-SPECIFIC IMPACTS OF DREDGING

B-5.1.1 GREAT I Channel Maintenance Plan

Placement sites were recommended for three dredge cuts in the St. Croix River (Table B-13). An estimated 1,269,000 cubic yards of material would be dredged from the St. Croix River under the GREAT I channel maintenance plan.

B-5.1.2 CMMP

Channel maintenance planning was completed for only one dredge cut, the Kinnickinnic Bar cut (Table B-13), in the St. Croix River. Two dredge cuts, Catfish Bar and Hudson, were placed on the inactive list on the basis of historical dredging patterns and current criteria for implementing maintenance dredging. An estimated 272,000 cubic yards of material would be dredged from the Kinnickinnic Bar cut over the course of the 40-year planning window.

Table B-13. Dredge cuts, St. Croix River.

Pool-Cut #	Cut Name	Location (RM)	GREAT I Status	CMMP Status
SC-3	Hudson	16.2 to 17.8	Active	Inactive
SC-2	Catfish Bar	11.5 to 12.2	Active	Inactive
SC-1	Kinnickinnic Bar	6.0 to 6.5	Active	Active

B-1.5.3 Impacts of Dredging

The impacts of dredging the St. Croix River are summarized below.

Acreage affected under GREAT I = 67.9 acres of main channel habitat.
Acreage affected under CMMP = 12.1 acres of main channel habitat.

a. Substantial (GREAT I) to minor (CMMP) impacts on main channel habitats, benthic invertebrates and fish, dredging opposed by US National Park Service; dredge cut located in the Lower St. Croix National Scenic Riverway, a unit of the National Wild and Scenic River System.
b. Sediments are uncontaminated coarse to medium sands; no impacts on water quality anticipated.
c. Freshwater mussel fauna would be adversely affected by dredging, impact would be minor.
d. No determination of the effects of dredging cut SC-1 on Federal threatened and endangered mussel species (mussel survey and coordination required; see Appendix C).
e. Displacement of recreational traffic and/or congestion at Kinnickinnic narrows would be substantial but short-term.

f. No cultural resources affected.
g. Minor adverse social effects associated with disruption of recreational traffic corridor.

B-5.1.4 Comparison of Plans

The GREAT I plan would have a substantially greater impact on main channel aquatic habitats and associated invertebrates and fauna than the CMMP (Tables B-14 and B-15). Maintenance of all three cuts projected under GREAT I would result in dredging of 2.8 miles of main channel versus 0.5 mile under the CMMP.

The CMMP would likely not affect Federal threatened and endangered species (Table B-15), however, mussel surveys of the dredge cut would be completed and the results coordinated with the USFWS to confirm this determination. The impacts of the GREAT I plan on threatened and endangered species have never formally been assessed (Table B-14).

Both plans would result in disruption of recreational traffic patterns at the Kinnickinnic narrows during dredging operations; however, the GREAT I plan would also disrupt traffic at the Catfish Bar and Hudson cuts.

B-5.2 SITE-SPECIFIC IMPACTS OF DREDGED MATERIAL PLACEMENT

B-5.2.1 GREAT I Channel Maintenance Plan

The GREAT I channel maintenance plan for the St. Croix River identified a large number of sites suitable for placement of dredged materials. The evaluation of impacts of use of alternative placement sites and the justification for recommendation of sites for the St. Croix River pool are provided on pages 103-107 of the GREAT I EIS (Volume 9 of the GREAT I Technical Appendices) and incorporated by reference in this document. In total, GREAT I recommended and prioritized 15 sites in the St. Croix River. The impacts of using all sites recommended by GREAT I are presented below.

B-5.2.2 CMMP

Subsequent planning for implementation of the GREAT I plan resulted in several relevant changes. Two dredge cuts, Catfish Bar and Hudson, were placed on the inactive list. This obviated the need for sites for placement of materials from these cuts. Additionally, based on revised projections of dredged material quantities, many sites recommended by GREAT I would not be needed. As a result, three sites were selected for use under the CMMP. Sites **SC-6.5-LWP (SC.12; Kinnickinnic Bar Lower)** and **SC-6.7-LWP (SC.13; Kinnickinnic Bar Upper)** were selected as the primary and secondary placement sites. The use of these sites was adjoined with beach development plans for the Kinnickinnic State Park located at the sites. To be consistent with park development plans, the estimated base acreages of the two sites were revised downward to 7 and 4 acres, respectively. Also, the estimated pile height for site SC-6.7-LWP

was dropped to 3 feet. **Site 3-811.5-LMP (3.34; Point Douglas)** was recommended as a site to use should the other sites be unavailable. Sites SC-6.5-LWP and SC-6.7-LWP were selected because of limited impacts resulting from site use and location in relation to the dredge cut. Site 3-811.5-LMP was selected because of limited impacts and the need for a large site if the other two sites are not available. Descriptions of the existing conditions and proposed developments at these sites are provided in TAB 9 of the CMMP. The impacts of dredged material placement at the CMMP selected sites are summarized below. For additional detail on the impacts of the GREAT I plan and CMMP, the reader should refer to Section 5.0 of this EIS, the GREAT I EIS, the Section 404(b)(1) Evaluation (see Appendix D) and the Biological Assessment (see Appendix C).

B-5.2.3 Impacts of Site Use

SC-22.0-RMP (SC.24) - GREAT I recommended tertiary site

Site SC-22.0-RMP (SC.24) is located at the Alan King Generating Station in Bayport, Minnesota. The site is disturbed and adjacent to the plant's coal pile.

Acreage affected under GREAT I = 16 acres of type 1-2 wetland.

a. Minor adverse impacts on fish and wildlife resources.
b. No water quality impacts (mechanical disposal only).
c. No assessment of impacts on threatened and endangered species completed.
d. No floodplain impacts.
e. No recreation impacts.
f. Low potential for cultural resource impacts. A survey is required, as is coordination with MNSHPO.
g. No appreciable social impacts.
h. High anticipated beneficial use demand; 100 percent removal projected.
i. No adverse impacts on aesthetics (site is already highly disturbed).

SC-18.2-RMP (SC.18) - GREAT I recommended tertiary site

Site SC-18.2-RMP (SC.18) is an open water site near the Minnesota shoreline. The purpose of placement at this site would be to extend an exposed sandbar into the right shore at RM 18.2.

Acreage affected under GREAT I = 4 acres of open water and 2 acres of recreational beach; 6 acres total.

a. Minor adverse impacts on fish and wildlife resources.
b. Water quality impacts expected to be temporary and minor; violation of State turbidity and suspended solids standards likely.
c. No assessment of impacts on threatened and endangered species completed.

d. Minor adverse floodplain impacts (site is within both the floodplain and floodway).
e. Beneficial recreation impacts resulting from creation of an open sandy bar.
f. No cultural resource impacts.
g. No appreciable social impacts; benefits to recreation.
h. No beneficial use removal anticipated (island site).
i. Minor impacts on aesthetics.

SC-17.5-LWP (SC.28; Above Hudson Railroad Bridge) - GREAT I recommended tertiary site

Site SC-17.5-LWP (SC.28; Above Hudson Railroad Bridge) is an island located above the railroad bridge at Hudson. The site is an old island placement site nearly devoid of vegetation and heavily used by recreationists.

Acreage affected under GREAT I = 4 acres of recreational beach.

a. Minor adverse impacts on fish and wildlife resources
b. Water quality impacts expected to be temporary and minor (primarily mechanical placement).
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts (site with both floodplain and floodway).
e. Beneficial recreation impacts resulting from maintenance of island in an open sandy condition.
f. No cultural resource impacts.
g. No appreciable social impacts; benefits to recreation.
h. No beneficial use removal anticipated (island site).
i. No impacts on aesthetics (site is already disturbed).

SC-17.0-LWP (SC.22; Hudson) - GREAT I recommended secondary site

Site SC-17.0-LWP (SC.22; Hudson) is a generic site comprising potential use of material at the Lakefront Park in Hudson for beach development and lakefront upgrading.

Acreage affected by GREAT I = 1.5 acres of open water aquatic and 1.5 acres of disturbed terrestrial habitat; 3 acres total.

a. Little or no fish and wildlife impacts
b. Water quality impacts expected to be temporary and minor.
c. No assessment of impacts on threatened and endangered species completed.
d. Potential for adverse floodplain impacts (site within floodplain but not floodway).
e. Potential for beneficial recreation impacts from use of material for beach nourishment and other park improvements.
f. Low potential for cultural resource impacts. A survey is required, as is coordination with WISHPO.

g. Minor benefits to the character and economy of Hudson, WI resulting from maintenance of highly desirable recreational areas (parks and beaches).
h. Material available for beneficial use.
i. No impacts on aesthetics.

SC-16.6-LWP (SC.01; Beer Can Island) - GREAT I recommended primary site

Site SC-16.6-LWP (SC.01; Beer Can Island) is an in-water disposal along the Wisconsin shoreline. This site involved a GREAT proposal to place material in seven acres of open water to connect the site with the nearby dike.

Acreage affected under GREAT I = 7 acres of open water.

a. Minor adverse impacts on fish and wildlife resources.
b. Water quality impacts expected to be temporary and minor.
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts (sites within both the floodplain and floodway).
e. Beneficial recreation impacts resulting from maintenance of islands in an open sandy condition.
f. No cultural resource impacts.
g. Minor benefits to the character and economy of Hudson, WI resulting from maintenance of highly desirable recreational areas (beaches).
h. No beneficial use removal projected (island site with no access).
i. No adverse aethetic impacts (sites are already highly disturbed).

SC-17.4-LWP (SC.06; Beer Can Island), SC-17.1-LWP (SC.05; Beer Can Island), SC-17.1-LWP (SC.04; Beer Can Island), and SC-16.9-LWP (SC.03; Beer Can Island) - GREAT I recommended primary and tertiary sites

Site SC-17.4-LWP (SC.06), Site SC-17.1-LWP (SC.05), Site SC-17.1-LWP (SC.04), Site SC-16.9-LWP (SC.03) and Site SC-16.6-LWP (SC.01; Beer Can Island) are a series of small islands adjacent to the channel at Hudson, Wisconsin. They are in various stages of revegetation by willow and brush, but lack the adjacent marsh habitat typical of many UMR islands. The sites are heavily used by recreationists.

Acreage affected by GREAT I = 7 acres of recreational beach.

a. Minor adverse impacts on fish and wildlife resources.
b. Water quality impacts expected to be temporary and minor (mechanical disposal).
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts (sites within both the floodplain and floodway).
e. Beneficial recreation impacts resulting from maintenance of islands in an open sandy condition.

f. No cultural resource impacts.
g. Minor benefits to the character and economy of Hudson, WI resulting from maintenance of highly desirable recreational areas (beaches).
h. No beneficial use removal projected (all island sites with no access).
i. No adverse impacts (sites are already highly disturbed).

SC-13.5-RMP (SC.21) - GREAT I recommended primary site

Site SC-13.5-RMP (SC.21) is a beach nourishment site at the public beach at Lake St. Croix.

Acreage affected under GREAT I = 5 acres of recreational beach.

a. Little or no fish and wildlife impacts (5 acres of recreational beach affected).
b. Water quality impacts expected to be temporary and minor; State standards for turbidity and suspended solids likely violated.
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts (site within both floodplain and floodway).
e. Beneficial recreation impacts resulting from maintenance of a public beach.
f. No cultural resource impacts.
g. No appreciable social impacts; benefits to recreation.
h. No beneficial use removal expected; however, beach nourishment considered passive beneficial use.
i. No adverse impacts on aesthetics.

SC-8.5-RMP (SC.27) - GREAT I recommended secondary site

Site SC-8.5-RMP (SC.27) is at Afton State Park. Material would be used in the park for fill or for beach nourishment.

Acreage affected under GREAT I = 2 acres of type 1-2 wetlands.

a. Potential adverse wildlife impacts if material is used in the park to fill wetlands.
b. Water quality impacts temporary and minor if material is used for beach nourishment; no impacts if material is used as fill in the park.
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts if material is used for beach nourishment (site is within both the floodplain and floodway).
e. Beneficial recreation impacts from use of the material to enhance park features.
f. Potential adverse cultural resource impacts; site must be coordinated with MNSHPO.
g. No appreciable social impacts; benefits to recreation.
h. No beneficial use removal expected; beach nourishment considered passive beneficial use.
i. No adverse impacts on aesthetics.

SC-6.7-LWP (SC.13; Kinnickinnic Bar Upper) - GREAT I recommended secondary site, CMMP selected site

Site SC-6.7-LWP (SC.13; Kinnickinnic Bar Upper) is located on the upper end of the Kinnickinnic River delta. The site has been used in the past and is almost entirely covered with old dredged material and sand. Some willows and young floodplain forest trees have established on-site.

Acreage affected under GREAT I = 9 acres recreational beach.
Acreage affected under CMMP = 3 acres old dredged material and 1 acre recreational beach; 4 acres total.

a. Little or no adverse fish and wildlife impacts under both plans.
b. Material is relatively clean, coarse to medium sand; adverse water quality impacts would be short-term and minor with hydraulic placement; no impacts if mechanical placement.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse floodplain impacts (site is within both the floodplain and floodway).
e. Beneficial recreation impacts resulting from beach nourishment and park enhancement.
f. No cultural resource impacts; site must be coordinated with WISHPO.
g. Beneficial social effects resulting from recreation enhancement through park development.
h. No beneficial use removal expected.
i. No adverse impacts on aesthetics (visual qualities of site already impaired by past use).

SC-6.5-LWP (SC.12; Kinnickinnic Bar Lower) - GREAT I recommended primary site, CMMP selected site

Site SC-6.5-LWP (SC.12; Kinnickinnic Bar Lower) is an old placement site on the lower delta of the Kinnickinnic River. The site is almost entirely vegetated by willow and small cottonwoods.

Acreage affected under GREAT I = 17 acres recreational beach.
Acreage affeced under CMMP = 5 acres of old dredged material and 2 acres recreational beach; 7 acres total.

a. Minor adverse fish and wildlife impacts.
b. Material is relatively clean, coarse to medium sand; adverse water quality impacts would be short-term and minor with hydraulic placement; no impacts with mechanical placement.
c. No adverse effects on Federal threatened and endangered species (see Appendix C).
d. Minor adverse floodplain impacts (site is within both the floodplain and floodway).
e. Beneficial recreation impacts resulting from beach nourishment and park enhancement.
f. No cultural resource impacts; site must be coordinated with WISHPO.
g. Beneficial social effects resulting from recreation enhancement through park development.
h. No beneficial use removal expected.
i. No adverse impacts on aesthetics (visual qualities of site already impaired by past use).

SC-0.5-RMP (SC.16; Point Douglas Nearshore) - GREAT I recommended tertiary site

Site SC-0.5-RMP (SC.16; Point Douglas Nearshore) is an open water site off the Point Douglas Beach. Use of the site would involve the creation of an island approximately 500 feet off the public beach located on Point Douglas adjacent to the mouth of the St. Croix River.

Acreage affected under GREAT I = 2.5 acres of open water.

a. Minor adverse fish and wildlife impacts.
b. Adverse water quality impacts would be short-term and minor.
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. Beneficial recreation impacts from creation of additional public swimming, beaching and camping areas.
f. Low potential for cultural resources. A survey is required, as is coordination with MNSHPO.
g. Beneficial social effects resulting from recreation enhancement.
h. No beneficial use removal projected.
i. Minor impacts on aesthetics.

SC-0.2-RMP (SC.26; Point Douglas Beach) - GREAT I recommended tertiary site

Site SC-0.2-RMP (SC.26; Point Douglas Beach) is the public beach at Point Douglas near the mouth of the St. Croix River. Material would be placed here for beach nourishment.

Acreage affected under GREAT I = 2.5 acres of open water aquatic and 2.5 acres of recreational beach; 5 acres total.

a. Minor adverse fish and wildlife impacts.
b. Adverse water quality impacts would be short-term and minor.
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. Beneficial recreation impacts for maintaining and enhancing public beach.
f. Low potential for cultural resources; coordination with MNSHPO required.
g. Beneficial social effects resulting from recreation enhancement.
h. No beneficial use removal projected.
i. No adverse impacts on aesthetics.

3-811.5-LMP (3.34; Point Douglas) - GREAT I recommended primarily as a site to place materials if other sites are unavailable, CMMP selected site

Site 3-811.5-LMP (3.34; Point Douglas) is a publicly owned site on the left bank of the UMR near the mouth of the St. Croix River. The site is a partially water filled pothole lying between

the Burlington Northern Railroad tracks and Highway 10. About 4 acres of the site is wetland, with the remainder of the site forested.

Acreage affected under GREAT I = 4 acres of type 3-4-5 wetlands and 6 acres of upland forest; 10 acres total.
Acreage affected under CMMP = 4 acres of type 3-4-5 wetlands and 6 acres of upland forest; 10 acres total.

a. Minor adverse impacts on fish and wildlife resources.
b. No water quality impacts for mechanical placement; minor and short-term impacts if hydraulic.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. No floodplain effects (site is out of the floodplain and floodway).
e. Potential parking area for Point Douglas Beach could enhance recreation.
f. No cultural resource impacts.
g. No appreciable social impacts.
h. Some beneficial use removal projected under GREAT I; no beneficial use removal projected under the CMMP.
i. Minor adverse impacts on aesthetics.

B-5.2.4 Comparison of Plans

The GREAT I channel maintenance plan for the St. Croix River included a large number of recreational beach and island sites which, in combination, would result in rather substantial impacts on fish and wildlife habitat (Table B-14). Not including Site 3-811.5-LMP (3.34; Point Douglas), approximately 35.5 acres of wetland and 48 acres of upland would be affected under the GREAT I plan. In contrast, the CMMP, not including Site 3-811.5-LMP (3.34; Point Douglas) would affect only 11 acres of upland habitat. [Note: While Site 3-811.5-LMP (3.34; Point Douglas) would likely be used for placement of materials from the St. Croix River dredged cuts under both plans, the site's primary use would be for placement of materials from cuts in pool 3. Thus, the acres affected at this site are considered and included in the impacts for the pool 3 plans.] However, it should be recognized that many of the sites recommended under the GREAT I plan would not be needed because of the inactivation of the Hudson and Catfish Bar cuts. Both plans would have only minor impacts on water quality (Tables B-14 and B-15).

The CMMP would have no effect on threatened and endangered species (Table B-15). The impacts of the GREAT I plan on threatened and endangered species have never been formally assessed (Table B-14).

All sites under both plans would need to be coordinated with the appropriate State SHPOs; however, the likelihood of impacts to cultural resources under either plan is low. Overall, the CMMP calls for fewer acres, but until more is known about the land to be affected, a final assessment of which sites would be better cannot be completed.

The GREAT I plan would probably result in substantial benefits to the recreation resource (Table B-14); many beach sites would be nourished or upgraded. However, some disturbance during placement site development and use would displace recreational activities, resulting in minor adverse impacts. The CMMP would nourish/upgrade two beach sites. Beneficial use removal of materials under both plans would primarily occur from site 3-811.5-LMP (3.34; Point Douglas), however, the quantity of material placed at this site as a result of dredging would be low compared to materials placed there from pool 3. Beneficial use removal which could be attributed to dredging on the St. Croix would be low under both plans.

Table B-14. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

ST. CROIX RIVER - GREAT

PARAMETER	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values					X		
3. Recreational Opportunities		X			X		
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use				X			
10. Controversy					X		
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services			X				
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply				X			
8. Commercial Navigation				X			
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands						X	
4. Aquatic Habitat						X	
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils				X			
11. Threatened or Endangered Species				U*			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

Table B-15. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

ST. CROIX RIVER - CMMP

	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values				X			
3. Recreational Opportunities			X		X		
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use				X			
10. Controversy					X		
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services			X				
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply				X			
8. Commercial Navigation				X			
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands				X			
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion				X			
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils				X			
11. Threatened or Endangered Species				X			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

B-6.0 POOL 3

B-6.1 SITE-SPECIFIC IMPACTS OF DREDGING

B-6.1.1 GREAT I Channel Maintenance Plan

Channel maintenance planning was completed for nine dredge cuts in pool 3 (Table B-16). An estimated 2,733,500 cubic yards of material would be dredged from pool 3 under the GREAT I channel maintenance plan.

B-6.1.2 CMMP

Based on historical dredging patterns and current criteria for implementing maintenance dredging, two dredge cuts--the Vermillion River and Pine Coulee cuts--were placed on the inactive list under the CMMP. Additionally, the 4-Mile Island/Truedale Slough cut was divided into two separate cuts (4-Mile Island and Truedale Slough) to facilitate material placement planning (Table B-16). Over the 40-year planning period, a projected 1,444,000 cubic yards of material would be dredged from pool 3 under the CMMP.

Table B-16. Dredge cuts, Pool 3.

Pool-Cut #	Cut Name	Location (RM)	GREAT I Status	CMMP Status
3-9	Lower Approach to L/D 2	814.9 to 815.1	Active	Active
3-8	Vermillion River	813.0 to 815.5	Active	Inactive
3-7	Prescott	810.3 to 811.7	Active	Active
3-6	Pine Coulee	809.5 to 809.8	Active	Inactive
3-5B*	Truedale Slough	807.9 to 808.6	Active	Active
3-5A*	4-Mile Island	807.0 to 807.9	Active	Active
3-4	Big River	804.1 to 806.0	Active	Active
3-3	Morgan's Coulee	801.9 to 803.0	Active	Active
3-2	Coulter's Island	800.8 to 801.9	Active	Active
3-1	Diamond Bluff	798.8 to 800.4	Active	Active

* The Truedale Slough and 4-Mile Island cuts were considered one cut under GREAT I.

B-6.1.3 Impacts of Dredging

The impacts of dredging pool 3 are summarized below.

Acreage affected under GREAT I = 477.6 acres of main channel habitat.
Acreage affected under CMMP = 375.8 acres of main channel habitat.

a. Substantial adverse impacts on main channel habitats, fish and aquatic invertebrates under both plans.

b. Minor impacts on water quality expected (sediments are relatively uncontaminated).
c. Minor to substantial adverse impacts on freshwater mussels.
d. No determination of the effects of dredging cuts 3-7, 3-5A and 3-5B on Federal threatened or endangered species (mussel survey and coordination required; see Appendix C). No adverse impacts on Federal threatened and endangered species from dredging remaining active cuts.
e. Short-term displacement of recreational craft; minor or negligible effect.
f. No cultural resources affected.
g. No appreciable social impacts.

B-6.1.4 Comparison of Plans

Neither of the plans would be expected to have any significant adverse water quality impacts (Tables B-17 and B-18) because the main channel sediments in pool 3 are relatively uncontaminated and most impact events would be of short duration.

By not maintaining the Vermillion River and Pine Coulee cuts, the CMMP would result in less overall maintenance dredging in pool 3. The GREAT I plan would result in more maintenance dredging and thus greater impacts on environmental resources. The CMMP would likely not affect Federal threatened or endangered species, however, mussel surveys and coordination of survey results must be completed in three dredging locations to confirm this determination.

B-6.2 SITE-SPECIFIC IMPACTS OF DREDGED MATERIAL PLACEMENT

B-6.2.1 GREAT I Channel Maintenance Plan

The GREAT I study evaluated approximately 19 sites in pool 3. The evaluation of impacts of use of all the alternative sites considered by GREAT I, as well as justification for recommending placement sites for pool 3, is provided on pages 108-113 of the GREAT I EIS (Volume 9 of the GREAT I Technical Appendices). The evaluations completed for each of the GREAT I sites are incorporated by reference in this document. The GREAT I plan recommended the following sites as "primary": **3-814.3-RMP (3.47/3.48), 3-813.2-RMP (3.46; Hastings Harbor), 3-811.5-LMP (3.34; Point Douglas), 3-808.4-LWP (3.27; Dry Run Slough)** and **3-799.8-LWP (3.09; Diamond Bluff)**. Several of these sites were also recommended as secondary and/or tertiary sites. Two additional site were recommended as secondary/tertiary, **3-814.5-LMP (3.42)** and **3-799.4-RMP (3.43)**. Sites **3-802.3-RME (3.14)** and **3-801.7-LWE (3.12)** were recommended as suitable for temporary/emergency placement sites for the Morgan's Coulee and Coulter's Island cuts, respectively. The impacts of using these sites are summarized below. Descriptions of the existing conditions and site development impacts for the recommended GREAT I sites are provided in volume 8 of the Technical Appendices of the GREAT I study. The impacts of using the sites selected by GREAT I are summarized below.

B-6.2.2 CMMP

In subsequent planning for implementation of the GREAT I plan, six new placement sites were evaluated: 3-815.1-RMP (Hastings), 3-814.7-RMP (Koch Site), 3-800.0-LWP (3.50), 3-799.3-LWP (Ag. Land South) and 3-798.0-LWP (County/Private Gravel Pits). Additionally, based on historical dredging patterns and current criteria for implementing maintenance dredging, two dredge cuts--the Vermillion River and Pine Coulee cuts--were placed on the inactive list, obviating the need for placement sites for material from these cuts. The CMMP selected the following sites for permanent placement of dredged materials from pool 3: **3-815.1-RME (Hastings), 3-814.7-RMP (Koch site), 3-813.2-RMP (3.46; Hastings Harbor), 3-811.5-LMP (3.34; Point Douglas), 3-808.4-LWP (3.27; Dry Run Slough)**, and **3-798.0-LWP (County/Private Gravel Pits)**. Sites **3-802.3-RME (3.14T; Morgan's)** and **3-801.7-LWE (3.12T; Coulter's)** were selected as emergency sites. Site **3-799.2-RMT (3.07; Corps Island)** was selected as a transfer site for temporary storage of dredged materials. Descriptions of the existing conditions and proposed developments at these sites are provided in TAB 12 of the CMMP. The impacts of placement of dredged materials at these sites are summarized below. For additional detail on the impacts of the GREAT I plan and CMMP, the reader should refer to Section 5.0 of this EIS, the GREAT I EIS, the Section 404(b)(1) Evaluation (see Appendix D) and the Biological Assessment (see Appendix C).

B-6.2.3 Impacts of Site Use

3-815.1-RMP (Hastings) - CMMP selected permanent site

Site 3-815.1-RMP (Hastings) is a previously used beneficial use stockpile site located immediately below Lock and Dam 2.

Acreage affected under CMMP = 1 acre of disturbed terrestrial habitat.

a. No adverse fish and wildlife impacts.
b. No adverse water quality impacts (mechanical placement only).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. No adverse floodplain impacts.
e. No recreation impacts.
f. Low potential for cultural resource effects; site must be coordinated with MNSHPO.
g. No appreciable social impacts; safety concern associated with overhead power lines.
h. Beneficial use removal anticipated (emergency site).
i. Minor adverse impacts on aesthetics (visual intrusion of dredged material pile in park-like setting).

3-814.7-RMP (Koch Site) - CMMP selected site

Site 3-814.7-RMP (Koch Site) is an abandoned tanker field previously used for storage of petroleum products. The site is vegetated by grasses.

Acreage affected under CMMP = 7 acres of disturbed terrestrial habitat.

a. No adverse fish and wildlife impacts.
b. No adverse water quality impacts (mechanical placement only).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Potential minor adverse floodplain impacts.
e. No recreation impacts.
f. Low potential for cultural resource effects; site must be coordinated with MNSHPO.
g. No appreciable social impacts.
h. 100 percent beneficial use removal of materials projected.
i. No adverse impacts on aesthetics (previous and existing site use limits potential visual impacts).

3-814.5-LMP (3.42) - GREAT I recommended tertiary site

Site 3-814.5-LMP (3.42) is a beach nourishment site on the left bank of the UMR at RM 814.5.

Acreage affected under GREAT I = 4 acres of type 1-2 wetland and 4.5 acres of main channel border habitat; 8.5 acres total.

a. Minor impacts on fish and wildlife habitat
b. Water quality impacts expected to be temporary and minor; State standards for turbidity and suspended solids would likely be violated.
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. Beneficial recreation impacts resulting from nourishment of a beach area.
f. Low potential for cultural resource impacts. Site must be surveyed and coordinated with MNSHPO.
g. No appreciable social impacts; benefits to recreation.
h. No beneficial use removal projected.
i. No adverse impacts on aesthetics.

3-814.3-RMP (3.48) - GREAT I recommended secondary site

Site 3-814.3-RMP (3.48) is a proposed park development at Lake Rebecca below Lock & Dam 2.

Acreage affected under GREAT I = 1.5 acres of recreational beach habitat.

a. No fish and wildlife habitat impacts
b. No water quality impacts.
c. No assessment of impacts on threatened and endangered species completed.
d. No floodplain impacts (site is within the floodplain but not the floodway).
e. Use of material to enhance park features could benefit recreation.
f. Low potential for cultural resource impacts. Undisturbed areas must be surveyed and coordinated.
g. No appreciable social impacts; potential benefits to recreation.
h. No beneficial use removal projected; material used on-site for passive beneficial use.
i. Minor adverse impacts on aesthetics (visual intrusion of stockpile on park-like setting).

3-814.3-RMP (3.47) - GREAT I recommended primary site

Site 3-814.3-RMP (3.47) is a 1.5-acre area in the parking lot of a public boat landing located a short distance below Lock & Dam 2.

Acreage affected under GREAT I = 1.5 acres of disturbed terrestrial habitat.

a. No fish and wildlife habitat impacts.
b. No water quality impacts.
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. Recreational access to the river would be restricted by stockpile site; significant adverse impact on recreation.
f. Low potential for cultural resource impacts. Site must be coordinated with MNSHPO.
g. Aesthetic and safety concerns with juxtaposition of placement site and boat launching facility; significant adverse recreational concerns.
h. No beneficial use removal projected.
i. No adverse impacts on aesthetics (existing use of the site limits impacts on visual environment).

3-813.2-RMP (3.46; Hastings Harbor) - GREAT I recommended primary site, CMMP selected site

Site 3-813.2-RMP (3.46; Hastings Harbor) is a privately owned site in an agricultural field adjacent to the main channel. The site is bounded by bottomland forest and agricultural fields.

Acreage affected under GREAT I = 11 acres of agricultural field habitat.
Acreage affected under CMMP = 11 acres of agricultural field habitat.

a. No fish and wildlife habitat impacts under both plans.
b. No water quality impacts (mechanical placement only).
c. No threatened and endangered species affected.

d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. No impacts on recreation.
f. Site approved by MNSHPO on 9 January 1984.
g. Minor adverse social impact (location of site in relation to marina would reduce attractiveness of the area and possibly cause safety problems due to traffic).
h. 100 percent beneficial use removal projected under both GREAT I and CMMP, however, access to the site is very poor and would have to be improved before beneficial use removal could occur.
i. Minor adverse impacts on aesthetics (conversion of farm field to dredged stockpile).

3-811.5-LMP (3.34; Point Douglas) - GREAT I recommended primary site, CMMP selected site

Site 3-811.5-LMP (3.34; Point Douglas) is a publicly owned site on the left bank of the UMR near the mouth of the St. Croix River. The site is a partially water filled pothole lying between the Burlington Northern Railroad tracks and Highway 10. About 4 acres of the site is wetland, with the remainder of the site forested.

Acreage affected under GREAT I = 4 acres of type 3-4-5 wetlands and 6 acres of upland forest; 10 acres total.
Acreage affected under CMMP = 4 acres of type 3-4-5 wetlands and 6 acres of upland forest; 10 acres total.

a. Substantial adverse impacts on fish and wildlife resources.
b. No water quality impacts for mechanical placement; minor and short-term impacts if hydraulic.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. No floodplain effects (site is out of the floodplain and floodway).
e. Potential parking area for Point Douglas Beach could enhance recreation.
f. No cultural resource impacts.
g. No appreciable social impacts.
h. 54 percent beneficial use removal projected under GREAT I; no beneficial use removal projected under the CMMP.
i. Minor adverse impacts on aesthetics.

3-808.5-LWP (3.28) - considered, but not selected by the CMMP

Site 3-808.5-LWP (3.28) is a privately owned site located near Dry Run Slough. Bounded by the UMR, the Burlington Northern Railroad tracks and floodplain forest, the site itself is a floodplain forest situated on a delta formed by sediment deposited from local coulees. The site is a historic placement site last used in 1972. The vegetation on-site is primarily bottomland forest with some small willow thickets interspersed throughout. The dominant tree species is silver maple with pole-sized green ash and silver maple undergrowth. The ground cover is relatively sparse.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, approximately 8 acres of floodplain forest (type 1-2) were considered for dredged material placement under the dredged material placement reconnaissance report for middle pool 3.

a. Minor adverse impacts on fish and wildlife habitat.
b. Water quality impacts expected to be temporary and minor; State standards likely violated.
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts (site is within the floodplain).
e. Beneficial recreation impacts from creation of sandy riparian area.
f. Low cultural resource potential; survey and coordination with WISHPO required.
g. No appreciable social impacts.
h. Material available for beneficial use but no project of removal available.
i. Minor adverse impacts on aesthetics (conversion of floodplain forest to dredged material stockpile creates visual intrusion on riparian riverbank setting).

3-808.4-LWP (3.27; Dry Run Slough) - GREAT I recommended primary site, CMMP selected site

Site 3-808.4-LWP (3.27; Dry Run Slough) is a privately owned site located on the left riverbank below Prescott, Wisconsin. The site lies landward of the Burlington Northern Railroad tracks in the valley of Dry Run Slough, a dry wash coulee that runs through the center of the site. This upland site is about evenly divided between old field and forest habitats. The old field community is dominated by brome grass with scatterings of herbaceous species such as mullen, milkweed, goldenrod and asters. There are a few scattered red cedar, sumac and red pine in the area as well. The forested portions of the site are upland in topography but are vegetated by many tree species more common to bottomland forests such as green ash, cottonwood and black willow. It is possible that occasional flooding from Dry Run Slough prevents more typical upland species from growing here. Use of the site would require installation of a culvert through the railroad embankment to re-route the existing drainage channel through Dry Run Slough.

Acreage affected under GREAT I = 31 acres of type 1-2 wetlands.
Acreage affected under CMMP = 13 acres of type 1-2 wetlands.

a. Substantial adverse impacts on fish and wildlife habitats.
b. Minor adverse water quality impacts resulting from hydraulic placement and resulting effluent (no contaminants anticipated; suspended solids in the range of 50 to 300 ppm expected).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse floodplain impacts (site is within the floodplain and floodway of Dry Run Slough).
e. Beneficial impacts on recreation resulting from creation of sandy beach area.
f. Potential for cultural resource impacts; site must be surveyed and coordinated with WISHPO.

g. Significant adverse social impact resulting from disruption of the visual/aesthetic environment.
h. 34 percent beneficial use removal of material projected under the GREAT I plan; 43 percent beneficial use removal of material projected under the CMMP.
i. Minor to substantial adverse impacts on aesthetics (visual intrusion of dredged sand material).

3-805.5-RMP (3.44) - considered, but not selected by the CMMP

Site 3-805.5-RMP (3.44) is a federally owned site located in Gores Wildlife Management area. The site is a historic placement site last used in 1972. The area is primarily bottomland forest with two small bare sand areas remaining from previous placement activities. Vegetation is typical of bottomland forest, with silver maple, green ash, cottonwood and American elm the common tree species. The ground layer is dominated by nettle, with grape and raspberry also common.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, approximately 13 acres of floodplain forest (type 1-2) were considered for dredged material placement under the dredged material placement reconnaissance report for middle pool 3.

a. Substantial adverse impacts on fish and wildlife habitats.
b. Minor adverse water quality impacts; State standards likely violated.
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts (site is within the floodplain).
e. Beneficial impacts on recreation resulting from beach nourishment.
f. Low potential for cultural resources; survey and coordination with MNSHPO required.
g. Site is within the Prairie Island Community boundaries; use would require consultation with and approval of the community.
h. No beneficial use removal projected.
i. Minor adverse impacts on aesthetics (visual intrusion).

3-802.3-RME (3.14; Morgan's) - GREAT I recommended emergency, CMMP selected emergency

Site 3-802.3-RME (3.14; Morgan's) is located on an island upstream from Diamond Bluff, Wisconsin. The island is federally owned and has been used in the past for dredged material placement. Vegetation at the site includes floodplain forest species and cattails. Shallow marsh, floodplain forest and about 3 acres of old dredged material habitat characterize the site.

Acreage affected under GREAT I = 3 acres of type 1-2 wetlands, 4 acres of type 3-4-5 wetlands and 3.5 acres of old dredged material; 10.5 acres total.
Acreage affected under CMMP = 3 acres of type 1-2 wetlands.

a. Minor adverse impacts on fish and wildlife habitats under both plans, minor adverse impacts on Gores Wildlife Management Area, US Fish and Wildlife Service believes this site should be removed from the CMMP.
b. Minor adverse impacts on water quality associated with hydraulic placement and resulting effluent; no water quality impacts if mechanical.
c. Bald eagle habitats present in project vicinity; no determination of impacts on Federal threatened or endangered species (further information gathering and coordination with USFWS required; see Appendix C).
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. Minor benefits to recreation from creation of sandy beach area.
f. Low potential for cultural resource impacts; site must be coordinated with MNSHPO.
g. No appreciable social impacts.
h. No beneficial use removal projected (island site used for emergency placement).
i. Minor adverse impacts on aesthetics (conversion of island/floodplain forest vegetation to dredged material).

3-801.7-LWE (3.12; Coulter's) - GREAT I recommended emergency, CMMP selected emergency

Site 3-801.7-LWE (3.12; Coulter's) is located on the lower end of Coulter's Island approximately 4.8 miles upstream from Lock and Dam 3 at RM 801.7. The site is privately owned and has been used in the past for dredged material placement. Vegetation is characterized by low brush and bottomland hardwoods. The island is relatively flat, and the average ground elevation is approximately 10 feet higher than the low control pool.

Acreage affected under GREAT I = 6 acres of type 1-2 wetlands and 6 acres of old dredged material; 12 acres total.
Acreage affected under CMMP = 2 acres of type 1-2 wetlands and 1 acre of old dredged material; 3 acres total.

a. Minor adverse impacts on fish and wildlife habitats.
b. Minor adverse water quality impacts associated with hydraulic placement and resulting effluent.
c. No threatened and endangered species affected.
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. Minor benefits to recreation from creation of sandy beach area.
f. Low potential for cultural resource impacts; site must be coordinated with WISHPO.
g. Minor adverse impacts on aesthetics.
h. No beneficial use removal projected (island site used for emergency placement).
i. Minor adverse impacts on aesthetics (conversion of island/floodplain forest vegetation to dredged material).

3-800.0-LWP (Diamond Bluff Pit) - considered, but not selected by CMMP

Site 3-800.0-LWP (Diamond Bluff Pit) is located landward of the Burlington Northern Railroad embankment and north of Diamond Bluff, Wisconsin, at RM 800.0. The site, which is privately owned, is an active gravel pit situated at the base of a vertical face bluff. Approximately 3 acres at this site would be used for material placement. The site has sparse, if any, vegetative growth due to the quarry operation. Because the substrate is predominantly gravel and coarse sand, vegetation of only a limited quality and quantity can occur.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, approximately 3 acres of disturbed terrestrial habitat were considered for dredged material placement under the dredged material placement reconnaissance report for lower pool 3.

a. No adverse impacts on fish and wildlife habitat.
b. No adverse water quality impacts associated with hydraulic placement in the gravel pit site; however, use of the site would require in-water rehandling with minor adverse effects on water quality.
c. No assessment of impacts on threatened and endangered species completed.
d. No adverse floodplain impacts.
e. No adverse impacts on recreation.
f. Potential for cultural resource impacts; site must be coordinated with WISHPO.
g. Both beneficial and adverse social impacts (demand for beneficial use stockpile exists; safety concerns associated with road and railroad crossings to access the site).
h. 100 percent beneficial use removal projected.
i. No adverse impacts on aesthetics (existing use of site limits potential impacts).

3-799.9-LWP (Diamond Bluff Beach) - considered, but not selected by CMMP

Site 3-799.9-LWP (Diamond Bluff Beach) is a narrow strip of riverbank located in Diamond Bluff, Wisconsin, adjacent to the boat landing and UMR at RM 799.9. The site is privately owned, and future development plans are unknown. The topography of the site is stepped toward the river with elevations ranging from 700 ft msl at the road to 675 ft msl at the low control pool elevation. The upland portion of the site is sparsely vegetated and sandy; the lower portion toward the slough is vegetated with bottomland hardwoods. The site consists of approximately 6 acres of bottomland forest, 2 acres of terrestrial herbaceous habitat, 1 acre of brush and willow, 1 acre of sand, 1 acre of shallow marsh and 1 acre of shallow aquatic habitat. The northern one-third of the site is used for recreation and contains a public boat launching facility and several fire pits.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, approximately 8 acres of type 1-2 wetland, 1 acre of old dredged material, 1 acre of main channel border aquatic and 2 acres upland forest were considered for dredged material placement under the dredged material placement reconnaissance report for middle pool 3.

a. Substantial adverse impacts on fish and wildlife habitat.
b. Minor, temporary adverse water quality impacts associated with site use.
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. Minor beneficial effects on recreation from creation of sandy beach-like area.
f. Cultural resource survey required before use. Site must be coordinated with WISHPO.
g. No appreciable social impacts; minor benefits to recreation.
h. No beneficial use removal projected.
i. Minor adverse impacts on aesthetics (conversion of riparian/riverbank area to dredged sand creates visual intrusion).

3-799.8-LWP (3.09; Diamond Bluff) - GREAT I recommended primary site

Site 3-799.8-LWP (3.09; Diamond Bluff) is located downstream from Diamond Bluff, Wisconsin. Lying approximately 1,200 feet from the UMR, the site is elevated 30 feet higher than the low control pool. The Burlington Northern Railroad embankment borders the landward side of this site. Vegetation at the site is characterized by meadow with mature hardwoods surrounding the site.

Acreage affected under GREAT I = 35 acres of type 1-2 wetland.

a. Substantial adverse impacts on fish and wildlife habitats.
b. Minor adverse water quality impacts associated with in-water rehandling of material.
c. No assessment of impacts on threatened and endangered species completed.
d. No floodplain impacts (site is out of the floodplain and floodway).
e. No appreciable impacts on recreation.
f. Potential cultural resource impacts. Site must be surveyed and coordinated with WISHPO.
g. Substantial adverse social impacts (significant impact on the aesthetic environment of the surrounding area; safety concerns associated with the site's proximity to residential areas).
h. 22 percent beneficial use removal of materials projected.
i. Minor adverse impacts on aesthetics.

3-799.3-LWP (Ag. Land South) - considered, but not selected under the CMMP

Site 3-799.3-LWP (Ag. Land South) is located on the sand terrace southeast of Diamond Bluff, Wisconsin. The site has dry, sandy soils vegetated by mixed grasses and forbs. Because of the

site distance from the main channel, a permanent pipeline through a wetland area would be required for hydraulic dredging operations during transfer of materials from the rehandling site.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, approximately 10 acres of agricultural field habitat were considered for dredged material placement under the dredged material placement reconnaissance report for pool 3.

a. No adverse impacts on fish and wildlife habitat.
b. Minor, temporary adverse water quality impacts associated with hydraulic placement and resulting effluent.
c. No assessment of impacts on threatened and endangered species.
d. No adverse floodplain impacts (site is out of the floodplain and floodway).
e. No impacts on recreation.
f. Potential cultural resource impacts. Site must be surveyed and coordinated with WISHPO.
g. Substantial adverse social impacts (disturbance of nearby residential area).
h. 100 percent beneficial use removal projected.
i. Substantial adverse impacts on aesthetics (visual intrusion of stockpile on meadow/upland setting).

3-799.2-RMT (3.07; Corps Island) - CMMP selected transfer site

Site 3-799.2-RMT (3.07; Corps Island) is an island created by dredged material placement. Most of the site is currently used for dredged material placement.

Acreage affected under CMMP = 2 acres of type 1-2 wetlands and 5 acres of old dredged material; 7 acres total.

a. Minor adverse impacts on fish and wildlife habitat.
b. Minor, temporary adverse water quality impacts associated with hydraulic placement and resulting effluent; no water quality impacts if mechanical placement is employed.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. No appreciable impacts on recreation; however, periodic excavation would create temporary harbor-like area for recreational use.
f. Potential cultural resource impacts. Site must be surveyed and coordinated with MNSHPO.
g. No adverse social impacts.
h. No beneficial use removal projected (site is a temporary transfer site).
i. Minor to substantial adverse impacts on aesthetics (visual intrusion of stockpile on river setting).

3-798.0-LWP (County/Private Gravel Pits) - CMMP selected site

Site 3-798.0-LWP (County/Private Gravel Pits) is actually two abandoned gravel pits; one privately owned and one owned by Pierce County, Wisconsin. The county-owned pit would be the site of dredged material placement, while the privately-owned pit would be used as a settling basin for effluent discharged from the county-owned pit. Habitat on-site is representative of the past uses of this area for gravel mining.

Acreage affected under CMMP = 31 acres of abandoned quarry habitat.

a. No adverse impacts on fish and wildlife habitat.
b. No adverse surface water quality impacts associated with hydraulic placement in the gravel pit; potential adverse impacts on groundwater.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. No adverse floodplain impacts.
e. No adverse impacts on recreation.
f. Low potential for cultural resources impacts; site must be coordinated with WISHPO.
g. No adverse social impacts.
h. No beneficial use removal projected.
i. No adverse impacts on aesthetics (existing use of site limits potential impacts).

B-6.2.4 Comparison of Plans

Neither of the plans would be expected to have any significant adverse water quality impacts (Tables B-17 and B-18), because the main channel sediments in pool 3 are relatively uncontaminated and most impact events would be of short duration. However, from a water quality perspective, the plan that maximizes mechanical placement would be preferred. No difference exists between the CMMP and GREAT I plan in reference to the amount of material mechanically handled.

Approximately 79 acres of floodplain forest/wet meadow, 8 acres of shallow marsh, 4.5 acres of main channel border aquatic, 6 acres of upland forest, 9.5 acres of old dredged material, 11 acres of agricultural field, 1.5 acres of disturbed terrestrial and 1.5 acres of recreational beach habitat would be affected under the GREAT I plan. Comparative acreages under the CMMP include: 26 acres of floodplain forest/wet meadow, 4 acres of shallow marsh, 6 acres of upland forest, 6 acres of old dredged material, 11 acres of agricultural field, 8 acres of disturbed terrestrial and 31 acres of abandoned quarry habitat. GREAT I would affect 91.5 acres of wetlands in pool 3, while the CMMP would affect only 30 acres of wetland.

Two of the 9 GREAT sites have been approved. Three will require archeological survey work and 7 of 9 (including the ones to be surveyed) will require coordination. Two of the 10 CMMP sites have been approved. One requires survey work and coordination and 7 others coordination.

SITE	GREAT	CMMP	SECTION 106 STATUS
3-815.1-RMP (Hastings)	X	X	Coordination needed; min. review
3-814.7-RMP (Koch)		X	Coordination needed; min. review
3-814.5-LMP (3.42)	X		Coordination needed
3-814.3-RMP (3.47/3.48)	X		Survey required for undist. areas
3-813.2-RMP (3.46; Hastings Hbr.)	X	X	Approved
3-811.5-LMP (3.34; Point Doug.)	X	X	Coordination needed
3-808.4-LWP (3.27; Dry Run Sl.)	X	X	Survey required
3-802.3-LWE (3.14; Morgan's)	X	X	Coordination needed; min. review
3-801.7-LWE (3.12; Coulter's)	X	X	Approved
3-799.8-LWP (3.09)	X		Survey required
3-800.0-LWP (County Gravel Pit)		X	Coordination needed; min. review
3-799.2-RMT (3.07; Corps Isl.)		X	Coordination needed; min. review
3-798.0-LWP (Private Gravel Pit)		X	Coordination needed; min. review

GREAT 9 disposal sites

2 approved
3 require survey work
4 require coordination

CMMP 10 disposal sites

2 approved
1 requires further survey work
7 require further coordination

Table B-17. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

POOL 3 - GREAT

PARAMETER	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values						X	
3. Recreational Opportunities			X				
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations					X		
9. Existing/Potential Land Use					X		
10. Controversy						X	
B. ECONOMIC EFFECTS							
1. Property Values					X		
2. Tax Revenues					X		
3. Public Facilities and Services				X			
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply			X				
8. Commercial Navigation			X				
9. Floodplain Effects					X		
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands						X	
4. Aquatic Habitat						X	
5. Habitat Diversity and Interspersion						X	
6. Biological Productivity					X		
7. Surface Water Quality				X			
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				U*			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

Table B-18. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

POOL 3 - CMMP

	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values						X	
3. Recreational Opportunities			X				
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations					X		
9. Existing/Potential Land Use					X		
10. Controversy						X	
B. ECONOMIC EFFECTS							
1. Property Values					X		
2. Tax Revenues					X		
3. Public Facilities and Services				X			
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply			X				
8. Commercial Navigation			X				
9. Floodplain Effects					X		
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands						X	
4. Aquatic Habitat						X	
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality				X			
8. Water Supply				X			
9. Groundwater				X			
10. Soils				X			
11. Threatened or Endangered Species				X	U*		
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

B-7.0 POOL 4

B-7.1 SITE-SPECIFIC IMPACTS OF DREDGING

B-7.1.1 GREAT I Channel Maintenance Plan

Channel maintenance planning was completed for 11 dredge cuts located in pool 4 (Table B-19). Over the 40-year planning period, an estimated 6,249,000 cubic yards of material would be dredged from pool 4. Several high volume/high frequency cuts are located in lower pool 4. The significant contribution of sediment from the Chippewa River is evidenced by the projected 40-year quantity.

B-7.1.2 CMMP

Based on historical dredging patterns and current criteria for implementing maintenance dredging, the Above Trenton cut was placed on the inactive list (Table B-19). Additionally, the Reads Landing cut was divided into two separate cuts. Over the 40-year planning period, an estimated 6,155,500 cubic yards of material would be dredged from pool 4.

Table B-19. Dredge cuts, Pool 4.

Pool-Cut #	Cut Name	Location (RM)	GREAT I Status	CMMP Status
4-11	Above Trenton	795.5 to 796.4	Active	Inactive
4-10	Trenton	794.0 to 794.6	Active	Active
4-9	Cannon River	792.1 to 793.5	Active	Active
4-8	Above Red Wing High Bridge	790.8 to 791.2	Active	Active
4-7	Below Red Wing High Bridge	789.5 to 790.3	Active	Active
4-6	Head of Lake Pepin	781 to 785.4	Active	Active
4-5B*	Chippewa Delta	763.2	Active	Active
4-5A*	Reads Landing	761.8 to 763.8	Active	Active
4-4	Above Crats Island	758.5 to 759.5	Active	Active
4-3	Above Teepeota Point	757.0 to 757.9	Active	Active
4-2	Grand Encampment	755.8 to 756.9	Active	Active
4-1	Beef Slough	753.9 to 754.6	Active	Active

* The Chippewa Delta and Reads Landing cuts were considered one cut under GREAT I.

B-7.1.3 Impacts of Dredging

The impacts of dredging in pool 4 are summarized below.

Acreage affected under GREAT I = 522.4 acres of main channel habitat.
Acreage affected under CMMP = 489.7 acres of main channel habitat.

a. Substantial adverse impacts on main channel habitats, benthic invertebrates and fish.
b. Sediments relatively uncontaminated fine to medium sands; minor impacts on water quality because of large quantities.
c. Diminished but recovering mussel fauna; anticipated effects minor to substantial.
d. No determination of the effects of dredging cuts 4-10, 4-8 and 4-7 on Federal threatened or endangered species (mussel surveys and coordination required; see Appendix C). No adverse impacts on Federal threatened and endangered species from dredging remaining active cuts.
e. Short-term displacement of recreational craft; minor effect.
f. No cultural resources affected.
g. No appreciable social effects; minor delays to commercial traffic possible.

B-7.1.4 Comparison of Plans

The main channel sediments in pool 4 are relatively uncontaminated and most impact events would be short-term in duration. However, the extent of dredging necessary in lower pool 4, in particular, has potential to have minor impacts on water quality. Neither plan would have any significant adverse water quality impacts (Tables B-20, B-21, B-22 and B-23).

The extent of dredging necessary in pool 4 would result in disturbance of large acreages of main channel habitat under both plans. The effects on aquatic invertebrates and fish species would be substantial. More main channel aquatic habitat would be affected under GREAT I because of the inclusion of the Above Trenton cut in this plan. Dredging under the CMMP would likely not affect Federal threatened and endangered species, however, mussel surveys and coordination of survey results with the USFWS are necessary to confirm this determination.

B-7.2 SITE-SPECIFIC IMPACTS OF DREDGED MATERIAL PLACEMENT

B-7.2.1 GREAT I Channel Maintenance Plan

The GREAT I study evaluated 30 potential placement sites for materials dredged from pool 4. The evaluation of impacts of use of all alternative sites considered by GREAT I as well as justification for recommending placement sites for pool 4 is provided on pages 114-121 of the GREAT I EIS (Volume 9 of the GREAT I Technical Appendices) and incorporated by reference in this document. The GREAT I plan for pool 4 recommended use of the following sites as primary sites: **4-794.7-RMP (4.63; Red Wing Yacht Club)**, **4-791.6-RMP (4.57; Red Wing Commercial Harbor)**, **4-789.6-RMP (4.49; Carlson Island)**, **4-785.0-RMP (4.37)**, **4-761.1-RMP (4.25; Carrel's Pit)**, **4-761.0-RMP (4.24; Wabasha Gravel Pit)** and **4-754.0-LWP (4.02; Alma Marina)**. Several of these sites were also recommended as secondary and/or tertiary sites for various dredge cuts. Sites **4-788.5-RMP (4.47; Colvill Park)**, **4-785.0-RMP (4.38)**, and **4-759.7-RMP (4.20)** were recommended as secondary sites. Sites **4-791.5-RMP (4.54)**, **4-759.4-RMP (4.18)** and **4-759.5-RMP (4.19)** were recommended as tertiary sites. Three emergency sites were also recommended: **4-762.7-LWT (4.29; Reads Landing)**, **4-757.5-LW (4.13;**

Teepeeota Point) and **4-756.5-LWT (4.10; Grand Encampment)**. Site **4-789.3-RMT (4.48)** was recommended as a rehandling site. Descriptions of the existing conditions and site development impacts for the recommended GREAT I sites are provided in volume 8 of the Technical Appendices of the GREAT I study. The impacts of using these sites are summarized below.

B-7.2.2 CMMP

In subsequent planning for implementation of GREAT I, evaluation of all the sites recommended by GREAT I (as listed above), three sites considered but not recommended by GREAT I (sites 4-793.6-RMP (4.60), 4-791.3-LMP (4.52), and 4-759.3-LWT (4.16; Crats Island)), and two new sites (4-760.2-RMP (MDNR.2) and 4-759.3-RMP (4.17)) was completed.

The CMMP would use the following permanent sites for placement of materials from pool 4: **4-794.7-RMP (4.63; Red Wing Yacht Club), 4-791.6-RMP (4.57; Red Wing Commercial Harbor), 4-788.5-RMP (4.47; Colvill Park), 4-761.1-RMP (4.25; Carrel's Pit), 4-761.0-RMP (4.24; Wabasha Gravel Pit), 4-760.2-RMP (MDNR.2), 4-759.5-RMP (4.19), 4-759.3-RMP (4.17), 4-757.5-LW (4.13; Teepeeota Point)** and **4-754.0-LWP (4.02; Alma Marina)**. Three transfer sites were also selected: **4-762.7-LWT (4.29; Reads Landing), 4-759.3-LWT (4.16; Crats Island)** and **4-756.5-LWT (4.10; Grand Encampment)**. Descriptions of the existing conditions and proposed developments at these sites are provided in TAB 13 and 14 of the CMMP. A summarization of the impacts of using these sites is provided below. For additional detail on the impacts of the GREAT I plan and CMMP, the reader should refer to Section 5.0 of this EIS, the GREAT I EIS, the Section 404(b)(1) Evaluation (see Appendix D) and the Biological Assessment (see Appendix C).

B-7.2.3 Impacts of Site Use

4-794.7-RMP (4.63; Red Wing Yacht Club) - GREAT I recommended primary site, CMMP selected site

Site 4-794.7-RMP (4.63; Red Wing Yacht Club) is owned by the Red Wing Yacht Club and has been previously used as a dredged material placement site. The site is located on the northeastern half of a peninsula bordered on the northeast by the main river channel. To the southwest of the site lies a buffer zone of bottomland forest bordered by a slough which runs the length of the site and adjoins the main channel to the east of the site. The site contains old dredged material and bottomland forest habitats. The old dredged material habitat exists on the northeastern half of the site, adjacent to the river. This portion of the site is revegetating and is overgrown with dense brush and some trees. The southwestern half and southeastern tip of the site are bottomland forest. Vegetation is more dense, comprised of large and small trees and brush. Large dead trees are scattered throughout. The overstory is closed and the understory is less dense than in the old dredged material area of the site.

Acreage affected under GREAT I = 4 acres of type 3-4-5 wetlands and 7 acres of old dredged material; 11 acres total.
Acreage affected under CMMP = 2 acres of type 1-2 wetlands and 4 acres of old dredged material; 6 acres total.

a. Minor adverse impacts on fish and wildlife habitat under both plans, site is located in a posted fish spawning area.
b. Minor to substantial adverse impacts on water quality associated with hydraulic placement and resulting effluent (suspended solids concentrations between 50 and 250 ppm expected); no adverse impacts if material is placed mechanically.
c. Bald eagle habitats present in site vicinity; further investigation and coordination with USFWS necessary to determine effects on Federal threatened or endangered species (see Appendix C).
d. Minor adverse floodplain impacts (site within floodplain and floodway).
e. Minor benefits to recreation resulting from maintenance of open sandy area adjacent to the river.
f. Low potential for cultural resource impacts. Site approved by MNSHPO on 23 August 1983.
g. No appreciable social impacts, benefits to recreation.
h. No beneficial use removal projected under GREAT I plan; 100 percent beneficial use projected under CMMP.
i. Minor adverse impacts on aesthetics (visual intrusion on riparian floodplain setting).

4-793.6-RMP (4.60) - considered, but not selected by CMMP

Site 4-793.6-RMP (4.60) is located upstream from Red Wing. It contains multiple private cottages scattered approximately 500 feet apart along the riverbank. The site is a narrow strip of bottomland forest. Vegetation is typical of this habitat type. The closed canopy contains maple, willow, cottonwood and ash. Large dead elm trees are interspersed throughout the site. The understory is made up of brush and saplings. Ground layer cover is thick, comprised of poison ivy, wild grape, nettle and various seedlings.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, approximately 22 acres of floodplain forest and 4 acres of old dredged material (26 acres total) were considered for dredged material placement under the dredged material placement reconnaissance report for upper pool 4.

a. Substantial adverse impacts on fish and wildlife habitats.
b. Minor to substantial adverse impacts on water quality associated with hydraulic placement and effluent return directly to the river (no berming or diking to contain effluent would be employed).
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts (site in floodplain and floodway).
e. Minor benefits to recreation resulting from beach nourishment.

f. Moderate potential for cultural resource impacts. Site approved by MNSHPO on August 8, 1983.
g. Minor benefits to social resources resulting from use of material for fill and beach nourishment.
h. No beneficial use removal projected; however, material used on site for passive beneficial purposes.
i. No adverse impacts on aesthetics.

4-791.6-RMP (4.57; Red Wing Commercial Harbor) - GREAT I recommended primary site, CMMP selected site

Site 4-791.6-RMP (4.57; Red Wing Commercial Harbor) is located behind Red Wing Pottery just north of the Red Wing Commercial Harbor approximately 750 feet from the UMR. The site is owned by the city of Red Wing and has potential for industrial development. A portion of the site has been previously filled and is currently used as a placement/storage area for sand, gravel and road salt. Eleven acres of this 13-acre site are used for this purpose. The site is within the floodplain and floodway. Adjacent land uses include a commercial harbor, a backwater of the Mississippi River and a paved city road. Vegetation on site consists of sparse grass cover. Mechanical dredging with rehandling of materials by truck from the commercial harbor dock would be required.

Acreage affected under GREAT I = 16 acres of disturbed terrestrial habitat.
Acreage affected under CMMP = 2 acres of type 1-2 wetlands and 11 acres of disturbed terrestrial habitat.

a. Minor adverse impacts on fish and wildlife habitat under both plans, site is located near a posted fish spawning area.
b. Potential adverse groundwater impacts from leaching of land fill material; no adverse impacts if mechanical placement.
c. No adverse impacts on Federal threatened or endangered species (see Appendix C).
d. Potential minor adverse floodplain impacts.
e. No impacts on recreation or the aesthetic environment.
f. Although known cultural resources in immediate area, low potential for cultural resource effects; site approved by MNSHPO on August 23, 1983.
g. Minor beneficial effects on socioeconomic resources (potential for industrial development on this site by the city of Red Wing, MN).
h. 52 percent beneficial use removal projected under GREAT I; 56 percent beneficial use removal projected under CMMP.
i. No adverse impacts on aesthetics (site is already disturbed).

4-791.5-RMP (4.54) - GREAT I recommended tertiary site

Site 4-791.5-RMP (4.54; Red Wing Harbor Site) is adjacent to the Red Wing commercial harbor. The site fronts on the harbor with developed areas behind. The site is projected for development by the city of Red Wing. Habitat on-site includes upland meadow and disturbed bottomland forest.

Acreage affected under GREAT I = although recommended by GREAT I, this site would not be required because adequate capacity is available at the other selected sites, however, 2 acres of type 1-2 wetlands, 1 acre of type 3-4-5 wetlands and 5 acres of disturbed terrestrial habitat; 8 acres total.

a. Minor adverse impacts on fish and wildlife habitat.
b. No water quality impacts.
c. No assessment of impacts on threatened and endangered species completed.
d. Potential minor adverse floodplain impacts.
e. No impacts on recreation.
f. Approved by the MNSHPO on August 23, 1983.
g. Site is projected for industrial expansion by city of Red Wing.
h. Material available for beneficial use; however, no projection of removal available.
i. Minor adverse impacts on aesthetics.

4-791.3-LWP (4.52) - considered, but not selected by CMMP

Site 4-791.3-LWP (4.52) is a privately owned site located directly across the main channel from Red Wing, Minnesota. The site is bordered on the northeast by a paved road, on the southwest by the main channel, and on the northwest and southeast by buffer zones of bottomland forest adjacent to residential areas. Vegetation on-site is comprised of bottomland species: elm, cottonwood, maple and willow. The understory of poison ivy, dogwood, sumac, elderberry and chokecherry is dense.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, up to 33 acres of floodplain forest (type 1-2 wetlands) were considered for dredged material placement under the dredged material placement reconnaissance report for upper pool 4.

a. Substantial adverse impacts on fish and wildlife habitats.
b. Minor adverse impacts on water quality associated with hydraulic placement and resulting effluent (suspended solids concentrations between 50 and 250 ppm expected).
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts.
e. Minor benefits to recreation resulting from creation of a sandy beach area adjacent to the river.

f. High potential for cultural resource impacts; site must be surveyed and coordinated with WISHPO.
g. Minor adverse impacts on social resources (adverse impacts on visual aesthetics and public concerns with wetland filling).
h. No beneficial use removal projected.
i. Minor adverse impacts on aesthetics.

4-789.6-RMP (4.49; Carlson Island) - GREAT I recommended primary site

Site 4-789.6-RMP (4.49) is located on Carlson Island, downstream from the U.S. Highway 63 bridge in Red Wing. The site lies on the northern quarter of the island and is approximately 2,200 feet long and between 100 and 200 feet wide. The main channel flows around the northern side of the site, while the remainder of Carlson Island lies to the south. A powerline bisects the island in approximately a north-south direction and is characterized by a cleared strip of land about 75 feet wide. The site is owned by the Red Wing Conservation Club. Habitat on site 4-789.6-RM is primarily bottomland forest, however, the site includes a strip of cleared powerline row and a sandy section of disturbed woods on the eastern side.

Acreage affected under GREAT I = 8 acres of type 1-2 wetlands.

a. Minor adverse impacts on fish and wildlife habitats.
b. Minor to substantial adverse impacts on water quality associated with hydraulic placement and resulting direct discharge of effluent to river (no diking or effluent retention proposed).
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts.
e. Beneficial impacts on recreation resulting from creation of sandy beach area adjacent to the river.
f. Low potential for cultural resource impacts. Site approved for use by MNSHPO on August 23, 1983.
g. No appreciable social impacts; benefits to recreation.
h. No beneficial use removal projected.
i. Minor adverse impacts on aesthetics.

4-789.3-RMP (4.48) - GREAT I recommended rehandling site

Site 4-789.3-RMP (4.48) is located on a peninsula below the Red Wing power plant. The site is located in floodplain forest habitat with some interspersed wet meadow habitat.

Acreage affected under GREAT I = 1 acre of type 1-2 wetland.

a. Minor adverse impacts on fish and wildlife habitats.
b. No adverse impacts on water quality (site use limited to mechanical placement).

c. No assessment of impacts on threatened and endangered species.
d. No adverse flooplain impacts.
e. Beneficial impacts on recreation from creation of sandy beach area.
f. Low cultural resource potential, however, survey required prior to use.
g. No appreciable social impacts; benefits to recreation.
h. No beneficial use removal (rehandling site).
i. No adverse impacts on aesthetics.

4-788.5-RMP (4.47; Colvill Park) - GREAT I recommended secondary site, CMMP selected site

Site 4-788.5-RMP (4.47; Colvill Park) is located in Colvill Park just downstream from downtown Red Wing, Minnesota. The site is owned by the city of Red Wing. The southern border of the site is a side channel with a boat access which is adjacent to Highway 61. The eastern border of the site is another side channel bordered on the east by a strip of bottomland forest on Baldwin Island. The site has been previously used as a dredged material placement area, and its foundation is old dredged material. The southern half of the site is wooded floodplain forest with a closed canopy in some areas.

Acreage affected under GREAT I = 6 acres of type 1-2 wetlands and 5 acres of disturbed terrestrial habitat; 11 acres total.
Acreage affected under CMMP = 5 acres of disturbed terrestrial habitat.

a. Minor adverse impacts on fish and wildlife habitats under GREAT I
b. No adverse water quality impacts (mechanical placement only).
c. Bald eagle habitats in site vicinity; additional investigation and coordination with USFWS necessary to determine effects (see Appendix C).
d. Minor adverse floodplain impacts.
e. Minor benefits to recreation resulting from use of material for park development.
f. Low potential for cultural resource impacts; site approved for use by MNSHPO on August 23, 1983.
g. Minor beneficial social effect resulting from park development; however, minor adverse impact associated with degradation of the aesthetic environment.
h. No beneficial use removal projected under GREAT I; no projection of beneficial use removal under CMMP.
i. Minor to subtantial adverse impacts on aesthetics (visual intrusion of dredged material stockpile in park-like setting).

4-785.0-RMP (4.37-4.38) - GREAT I recommended primary site

Site 4-785.0-RMP (4.38) is located approximately 1.5 miles from the UMR. The site is an active gravel pit used by the Minnesota Department of Transportation.

Acreage affected under GREAT I = 13 acres of abandoned quarry habitat.

a. No adverse fish and wildlife habitat impacts.
b. No appreciable adverse water quality impacts (mechanical placement only).
c. No assessment of impacts on threatened and endangered species completed.
d. No floodplain impacts.
e. No recreation impacts.
f. Moderate potential for cultural resource impacts; site must be surveyed and coordinated with MNSHPO.
g. No appreciable social impacts.
h. No beneficial use removal projected.
i. No adverse impacts on aesthetics.

4-762.7-LWT (4.29; Reads Landing) - GREAT I recommended emergency site, CMMP selected transfer site

Site 4-762.7-LWT (4.29; Reads Landing) is an historic placement site for the Reads Landing dredge cut. The site is located within the Upper Mississippi River Wildlife and Fish Refuge (UMRWFR) and is an old dredged material placement site.

Acreage affected under GREAT I = 9.5 acres of old dredged material.
Acreage affected under CMMP = 22 acres of old dredged material.

a. Minor adverse fish and wildlife habitat impacts under both plans.
b. Minor, short-term adverse impacts on water quality associated with hydraulic placement and resulting effluent return.
c. No adverse impacts on Federal threatened or endangered species (see Appendix C).
d. Potential minor adverse floodplain impacts (site is within floodplain and floodway).
e. No appreciable impacts on recreation; however, periodic excavation would create temporary harbor-like area for recreational use.
f. Low potential for adverse impacts on cultural resources; site must be surveyed and coordinated with MNSHPO.
g. No appreciable social impacts.
h. No beneficial use removal projected (site is an emergency/transfer site).
i. Minor adverse impacts on aesthetics (existing site is already a significant visual intrusion; continued use would not increase level of impact).

4-761.1-RMP (4.25; Carrel's Pit) - GREAT I recommended primary site, CMMP selected site

Site 4-761.1-RMP (4.25; Carrel's Pit) is a privately owned site in an abandoned, revegetated sandpit located immediately above Wabasha, Minnesota.

Acreage affected under GREAT I = 18 acres of abandoned quarry habitat.
Acreage affected under CMMP = 18 acres of abandoned quarry habitat.

a. Minor adverse impacts on fish and wildlife habitat (pipeline access would affect main channel border and shallow marsh habitats).
b. No adverse impacts on surface water quality; potential adverse impacts on groundwater.
c. No adverse impacts on Federal threatened or endangered species (see Appendix C).
d. No floodplain impacts.
e. No recreation impacts.
f. No cultural resource impacts. Site approved by MNSHPO on January 13, 1982.
g. Minor adverse social impacts (safety concerns associated with location of site in relation to residential area).
h. 15 percent beneficial use removal projected under GREAT I; no beneficial use removal projected under the CMMP.
i. No adverse impacts on aesthetics.

4-761.0-RMP (4.24; Wabasha Gravel Pit) - GREAT I recommended primary site, CMMP selected site

Site 4-761.0-RMP (4.24; Wabasha Gravel Pit) is a large abandoned sand and gravel pit located just northwest of Wabasha, Minnesota. The site has been used for placement in the past. It was used to empty site 4-762.7R-LW in 1984-85 and again in 1994-95. The site is approximately 1,500 feet from the UMR.

Acreage affected under GREAT I = 2 acres of type 1-2 wetlands, 8 acres of type 3-4-5 wetlands and 50 acres of abandoned quarry; 60 acres total.
Acreage affected under CMMP = 2 acres of type 1-2 wetlands, 8 acres of type 3-4-5 wetlands and 76 acres of abandoned quarry; 86 acres total.

a. Minor adverse impacts on fish and wildlife habitats.
b. No adverse impacts on surface water quality; potential adverse impacts on groundwater.
c. No adverse impacts on Federal threatened or endangered species (see Appendix C).
d. No floodplain impacts.
e. No recreation impacts (excellent site for dune buggy/ATV recreational use).
f. No cultural resource impacts. Site approved by MNSHPO on January 13, 1982.
g. Potential substantial benefits to socioeconomic resources (site has potential for future development by the city of Wabasha, MN).
h. 4 percent beneficial use removal projected under GREAT I; no beneficial use removal projected under the CMMP.
i. Minor adverse impacts on aesthetics (existing site is already a significant visual intrusion; continued use would not increase level of impact).

4-760.2-RMP (MDNR.2) - CMMP selected site

Site 4-760.2-RMP (MDNR.2) is an abandoned gravel pit located near Wabasha, Minnesota. The site has been actively mined until very recently, and the habitat conditions on site are indicative

of this disturbance. Little or no vegetation exists, and fish and wildlife habitat is limited. The site is highly disturbed and has already been used for dredged material placement under the CMMP.

Acreage affected under the CMMP = 30 acres of abandoned quarry habitat.

a. No adverse impacts on fish and wildlife habitats.
b. No adverse impacts on water quality.
c. No adverse impacts on Federal threatened or endangered species (see Appendix C).
d. No floodplain impacts.
e. No recreation impacts.
f. No cultural resource impacts. Site approved by MNSHPO on January 28, 1986.
g. No appreciable social impacts.
h. No beneficial use removal projected.
i. No adverse impacts on aesthetics (site is already highly disturbed).

4-759.7-RMP (4.20) - GREAT I recommended secondary site

Site 4-759.7-RMP (4.20) is adjacent to the river in Wabasha, Minnesota. This disturbed site is vegetated by bottomland hardwoods and is a past dredged material placement site.

Acreage affected under GREAT I = 6.4 acres of disturbed terrestrial habitat.

a. Little or no adverse impacts on fish and wildlife habitats.
b. Minor, short-term adverse water quality impacts.
c. No assessment of impacts on threatened and endangered species completed.
d. No floodplain impacts.
e. No recreation impacts.
f. Moderate potential for cultural resource impacts; site must be surveyed and coordinated with MNSHPO.
g. Potential adverse impacts on social resources (degradation of aesthetics and increased noise).
h. Material would be available for beneficial use removal.
i. Minor adverse impacts on aesthetics.

4-759.5-RMP (4.19) - GREAT I recommended tertiary site, CMMP selected site

Site 4-759.5-RMP (4.19) is a small gravel pit lying behind a marina in Wabasha, Minnesota (same marina as above). The site has already been filled under the CMMP.

Acreage affected under GREAT I = 5.7 acres of agricultural field habitat.
Acreage affected under CMMP = 6 acres of agricultural field habitat.

a. Little or no adverse impacts on fish and wildlife habitats.

b. Minor, short-term adverse impacts on water quality.
c. No adverse impacts on Federal threatened or endangered species (see Appendix C).
d. No floodplain impacts.
e. No recreation impacts.
f. Moderate potential for cultural resource impacts; site must be surveyed and coordinated with MNSHPO.
g. No appreciable social impacts.
h. 37 percent beneficial use removal projected under GREAT I; no beneficial use removal projected under the CMMP.
i. No adverse impacts on aesthetics.

4-759.4-RMT (4.18) - GREAT I recommended tertiary site

Site 4-759.4-RMT (4.18) is located adjacent to a marina in Wabasha, Minnesota. The site has been used for dredged material placement, and the habitat on site reflects this use.

Acreage affected under GREAT I = 3 acres of old dredged material habitat.

a. No appreciable fish and wildlife habitat impacts.
b. No water quality impacts.
c. No assessment of impacts on threatened and endangered species completed.
d. No floodplain impacts.
e. No recreation impacts.
f. No cultural resource impacts.
g. No appreciable social impacts.
h. Material available for beneficial use removal.
i. No adverse impacts on aesthetics.

4-759.3-RMP (4.17) - CMMP selected site

Site 4-759.3-RMP (4.17) is located immediately downstream from the lower boat harbor in Wabasha, Minnesota. The site had been used in the past for dredged material placement and has already been filled under the CMMP.

Acreage affected under CMMP = 3 acres of old dredged material.

a. No adverse impacts on fish and wildlife habitat.
b. Minor, short-term adverse impacts on water quality associated with hydraulic placement and resulting effluent.
c. No adverse impacts on Federal threatened or endangered species (see Appendix C).
d. No floodplain impacts.
e. No recreation impacts.
f. No cultural resource impacts.

g. No appreciable social impacts.
h. No beneficial use removal projected.
i. No adverse impacts on aesthetics.

4-759.3-LWT (4.16; Crats Island) - CMMP selected transfer site

Site 4-759.3-LWT (4.16; Crats Island) is a federally owned site located within the UMRWFR. Formerly used for dredged material placement, it contains a bermed containment area. The site includes a bottomland hardwood and backwater slough habitat.

Acreage affected under CMMP = 22 acres of old dredged material.

a. No adverse impacts on fish and wildlife habitat.
b. No appreciable adverse water quality impacts.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Potential minor adverse floodplain impacts (site is within floodplain and floodway).
e. No appreciable impacts on recreation; however, periodic excavation would create temporary harbor-like area for recreational use.
f. No adverse impacts on cultural resources. Site approved by WISHPO on January 28, 1986.
g. Minor adverse impacts on socioeconomic resources (degradation of visual aesthetic environment)
h. No beneficial use removal projected (site is a transfer site).
i. Minor adverse impacts on aesthetics (existing site is already a significant visual intrusion; continued use would not increase level of impact).

4-757.5-LW (4.13; Teepeeota Point) - GREAT I recommended emergency site, CMMP selected site

Site 4-757.5-LW (4.13; Teepeeota Point) is an existing bermed containment site lying within the UMRWFR. The site is bounded by bottomland hardwood and backwater channel habitats.

Acreage affected under GREAT I = 7.5 acres of old dredged material.
Acreage affected under CMMP = 46 acres of old dredged material.

a. Minor adverse impacts on fish and wildlife habitats
b. Minor, short-term adverse impacts on water quality resulting from hydraulic placement and resulting effluent return.
c. Bald eagle habitat present in site vicinity; further investigation and coordination necessary to determine impacts of site expansion on Federal threatened or endangered species (see Appendix C).
d. Minor adverse floodplain impacts (site is within floodplain and floodway).
e. No appreciable impacts on recreation.
f. No adverse impacts on cultural resources. Site approved by WISHPO on April 5, 1982.

g. Minor adverse impacts on social resources (degradation of visual aesthetic environment).
h. No beneficial use removal projected.
i. Minor adverse impacts on aesthetics (existing site is already a significant visual intrusion; continued use would not increase level of impact).

4-756.5-LWT (4.10; Grand Encampment) - GREAT I recommended emergency site, CMMP selected transfer site

Site 4-756.5-LWT (4.10; Grand Encampment) is an existing bermed containment site. It lies within the UMRWFR on an island that has been elevated by past placement of dredged materials.

Acreage affected under GREAT I = 4 acres of old dredged material.
Acreage affected under CMMP = 8 acres of old dredged material.

a. Minor adverse impacts on fish and wildlife habitats under both plans.
b. Minor, short-term adverse impacts on water quality resulting from hydraulic placement and resulting effluent return.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse floodplain impacts.
e. No appreciable impacts on recreation; however, periodic excavation would create temporary harbor-like area for recreational use.
f. No adverse impacts on cultural resources. Site approved by WISHPO on April 5, 1982.
g. Minor adverse impacts on social resources (degradation of visual aesthetic environment).
h. No beneficial use removal projected (site is a transfer site).
i. Minor adverse impacts on aesthetics (existing site is already a significant visual intrusion; continued use would not increase level of impact).

4-754.0-LWP (4.02; Alma Marina) - GREAT I recommended primary site, CMMP selected site

Site 4-754.0-LWP (4.02; Alma Marina) is a previously used placement site located immediately below the Alma small-boat harbor. The site is immediately downstream of the Beef River and about 1 mile upstream of L/D 4 and the city of Alma. The proposed placement area is triangular in shape, bounded on the north by the Alma small-boat harbor, on the east by the Burlington Northern railroad, and on the southwest by the UMR main channel.

Acreage affected under GREAT I = 10.3 acres of main channel border habitat.
Acreage affected under CMMP = 3 acres of main channel border habitat and 4 acres of old dredged material; 7 acres total.

a. Minor adverse impacts on fish and wildlife habitats under both plans.
b. Minor to substantial adverse impacts on water quality resulting from open water placement (both hydraulic and mechanical) of material.
c. No adverse impacts on Federal threatened and endangered species.

d. Minor adverse floodplain impacts.
e. No recreation impacts.
f. No adverse impacts on cultural resources. Site approved by WISHPO on April 5, 1982.
g. Minor adverse impacts on social resources (degradation of the visual aesthetic environment).
h. 88 percent beneficial use removal projected under GREAT I; 80 percent beneficial use removal projected under the CMMP.
i. Minor adverse impacts on aesthetics (existing site is already a significant visual intrusion; continued use would not increase level of impact).

B-7.2.4 Comparison of Plans

The main channel sediments in pool 4 are relatively uncontaminated, and most impact events would be short-term in duration. However, the extent of dredging necessary in lower pool 4 in particular has potential to have minor impacts on water quality. Neither plan would have any significant adverse water quality impacts (Tables B-20, B-21, B-22 and B-23). From a water quality perspective, maximization of mechanical placement would be preferable over hydraulic placement and/or in-water rehandling of dredged material. Both plans would utilize a combination of hydraulic and mechanical dredging. Comparatively, the impacts of both plans on water quality would be very similar.

Habitat acreages and types affected under GREAT I include: 17 acres of bottomland forest/wet meadow, 12 acres of shallow/deep marsh, 10.3 acres of main channel border aquatic, 31 acres of old dredged material, 5.7 acres of agricultural field, 27.4 acres of disturbed terrestrial and 81 acres of abandoned quarry. Comparable figures under the CMMP include: 6 acres of bottomland forest/wet meadow, 8 acres of shallow/deep marsh, 3 acres of main channel border aquatic, 109 acres of old dredged material, 6 acres of agricultural field, 16 acres of disturbed terrestrial habitat and 124 acres of abandoned quarry. The disparity in total acreage required under the CMMP (272 acres) and GREAT I plans (183.4 acres) arises from the unrealistic projections of beneficial use estimated by GREAT I. Beneficial use estimates provided by GREAT I have not been realized in lower pool 4. As a result, a much larger amount of land is required for placement of dredged materials under the CMMP. Use of the majority of sites proposed under the CMMP would not affect Federal threatened or endangered species, however, at two sites further investigation of potential impacts and coordination with the USFWS will be necessary.

The SHPOs have approved 13 of the 16 GREAT sites and 10 of the 13 CMMP sites. Of the remaining GREAT sites, 3 require further survey work, and of the remaining CMMP sites, 1 requires further survey work. Two GREAT sites requires initial coordination and 4 CMMP sites. Until the survey work is completed, we cannot compare the two plans for their effects on cultural resources. The amount of work needed to complete the cultural resources review depends on the results of the survey work and additional coordination.

SITE	GREAT	CMMP	SECTION 106 STATUS
4-794.7-RMP (4.63; RW Yacht Club)	X	X	Approved
4-791.6-RMP (4.57; RW Comm Hbr.)	X	X	Part. approved; more coord.
4-791.5-RMP (4.54; RW Hbr. Site)	X		Approved.
4-789.6-RMP (4.49)	X		Approved.
4-789.3-RMP (4.48)	X		Survey and coord. required
4-788.5-RMP (4.47; Colvill Park)	X	X	Approved
4-785.0-RMP (4.37/4.38)	X		Survey required
4-762.7-LWT (4.29; Reads Lnd.)	X	X	Survey req. of additional land
4-761.1-RMP (4.25; Carrel's Pit)	X	X	Approved
4-761.0-RMP (4.24; Wabasha Gr. Pit)	X	X	Part. app.; CMMP needs coord.
4-760.2-RMP (MDNR.2)		X	Approved
4-759.7-RMP (4.20)	X		Approved
4-759.5-RMP (4.19)	X	X	Approved
4-759.4-RMT (4.18)	X		Approved
4-759.3-RMP (4.17)		X	Approved
4-759.3-LWT (4.16; Crats Isl.)		X	Approved
4-757.5-LW (4.13; Teepeeota Pt.)	X	X	Approved
4-756.5-LWT (4.10; Grand Encamp.)	X	X	Approved
4-754.0-LWP (4.02; Alma Marina)	X	X	Approved

GREAT 16 disposal sites

13 approved
3 require survey work
2 require further coordination

CMMP 13 disposal sites

10 approved
1 requires further survey work
2 require further coordination

Table B-20. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

UPPER POOL 4 - GREAT

PARAMETER	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values					X		
3. Recreational Opportunities			X				
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use				X			
10. Controversy					X		
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services			X				
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply			X				
8. Commercial Navigation			X				
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands					X		
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				U*			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

Table B-21. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

UPPER POOL 4 - CMMP

PARAMETER	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values					X		
3. Recreational Opportunities				X			
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use				X			
10. Controversy				X			
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services				X			
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply			X				
8. Commercial Navigation			X				
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands					X		
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				X	U*		
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

Table B-22. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

LOWER POOL 4 - GREAT

	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values						X	
3. Recreational Opportunities			X				
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use					X		
10. Controversy					X		
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services			X				
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply			X				
8. Commercial Navigation			X				
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands					X		
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				U*			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning

Table B-23. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

LOWER POOL 4 - CMMP

PARAMETER	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE EFFECT	ADVERSE EFFECT		
	SIGNIFICANT	SUBSTANTIAL	MINOR		MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values						X	
3. Recreational Opportunities			X				
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use					X		
10. Controversy					X		
B. ECONOMIC EFFECTS							
1. Property Values			X				
2. Tax Revenues				X			
3. Public Facilities and Services				X			
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply			X				
8. Commercial Navigation			X				
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat						X	
3. Wetlands					X		
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				X	U*		
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning

B-8.0 POOL 5

B-8.1 SITE-SPECIFIC IMPACTS OF DREDGING

B-8.1.1 GREAT I Channel Maintenance Plan

Long-term channel maintenance planning was completed for the eight historic dredge cuts located in pool 5 (Table B-24). An estimated total volume of 3,061,500 cubic yards of material would be removed from pool 5 over the 40-year planning period under the GREAT I plan.

B-8.1.2 CMMP

Based on historical dredging patterns and current criteria for implementing maintenance dredging, the Mt. Vernon Light cut was placed on the inactive list (Table B-24). As a result, an estimated total volume of 2,925,000 cubic yards of material would be removed from pool 5 over the 40-year planning period.

Table B-24. Dredge cuts, Pool 5.

Pool-Cut #	Cut Name	Location (RM)	GREAT I Status	CMMP Status
5-8	Lower Approach to L/D 4	752.6 to 752.8	Active	Active
5-7	Mule Bend	748.6 to 749.6	Active	Active
5-6	West Newton	747.2 to 748.2	Active	Active
5-5	Below West Newton	746.0 to 746.8	Active	Active
5-4	Fisher Island	744.8 to 746.0	Active	Active
5-3	Lower Zumbro	744.0 to 744.6	Active	Active
5-2	Sommerfield Island	742.6 to 743.9	Active	Active
5-1	Mt. Vernon Light	741.2 to 741.6	Active	Inactive

B-8.1.3 Impacts of Dredging

The impacts of dredging in pool 5 are summarized below.

Acreage affected under GREAT I = 333.3 acres of main channel habitat.
Acreage affected under CMMP = 309.1 acres of main channel habitat.

a. Substantial adverse impacts on main channel habitats, benthic invertebrates and fish.
b. Negligible impacts on water quality (sediments are uncontaminated, medium to coarse sands).
c. Minor to substantial adverse impacts on freshwater mussels (mussel resources are degraded but recovering).
d. No determination of the effects of dredging cut 5-8 on Federal threatened or endangered species (mussel survey and coordination required; see Appendix C). No adverse impacts on Federal threatened and endangered species from dredging remaining active cuts.

e. Minor, short-term adverse impacts on recreation (recreational craft temporarily displaced or prohibited from dredge cut location).
f. No cultural resources affected.
g. No appreciable social impacts (potential for short-term delays to commercial navigation).

B-8.1.4 Comparison of Plans

Both the GREAT I plan and CMMP for pool 5 would have minor adverse effects on water quality (Tables B-25 and B-26). The main channel sediments in pool 5 are relatively uncontaminated and most dredging events are of short duration (2 to 3 days).

Both plans would have substantial adverse impacts on fish and aquatic invertebrates through disturbance of main channel habitats (Tables B-25 and B-26). The GREAT I plan would have slightly greater impacts resulting from maintenance of the Mt. Vernon Light cut, an inactive cut under the CMMP. Adverse impacts on Federal threatened or endangered species are unlikely under the CMMP, however, a mussel survey and coordination of survey results with the USFWS will be necessary in one cut to confirm this determination. The impacts of dredging under the GREAT I plan have not been assessed.

B-8.2 SITE-SPECIFIC IMPACTS OF DREDGED MATERIAL PLACEMENT

B-8.2.1 GREAT I Channel Maintenance Plan

The GREAT I study evaluated 15 sites for placement of materials dredged from pool 5. The evaluation of impacts of use of all alternative sites considered by GREAT I, as well as justification for recommending placement sites for pool 5, is provided on pages 122-126 of the GREAT I EIS (Volume 9 of the GREAT I Technical Appendices) and incorporated by reference in this document. The GREAT I plan for placement of materials dredged from pool 5 recommended the following primary sites: **5-751.2-LWP (5.26A)** and **5-744.0-RMP (5.30; Weaver Bottoms)**. Site **5-749.8-RMP (5.24; West Newton Chute)** was recommended as a secondary site, while sites **5-751.5-LWP (5.26; Alma Power Plant)** and **5-747.5-LWP (5.28; Buffalo City)** were recommended as tertiary sites. Two emergency sites were recommended by GREAT I: **5-748.0-RMT (5.18; Above West Newton)** and **5-745.8-RMT (5.12; Above Fisher Island)**. Although GREAT I recommended these sites, further analysis indicates only two permanent and two emergency sites would be necessary for containment of projected quantities. The four sites most likely used if the GREAT I plan were implemented include: 5-749.8-RMP (5.24; West Newton Chute), 5-748.0-RMT (5.18; Above West Newton), 5-745.8-RMT (5.12; Above Fisher Island) and 5-744.0-RMP (5.30; Weaver Bottoms). Descriptions of the existing conditions and site development impacts for the selected GREAT I sites are provided in Volume 8 of the Technical Appendices of the GREAT I study. The impacts of using the sites selected by GREAT I are summarized below.

B-8.2.2 CMMP

In subsequent planning for implementation of the GREAT I plan, all the GREAT I recommended sites listed above, two sites evaluated by GREAT I but not selected (5-749.0-RMP (5.21) and 5-746.6-RMP (5.14)), and two new sites (5-751.8-LWP and 5-744.7-LWT (5.08; Lost Island)) were evaluated as potential dredged material placement sites.

The CMMP for pool 5 would use the following sites for permanent placement of materials: **5-749.8-RMP (5.24; West Newton Chute)** and **5-744.0-RMP (5.30; Weaver Bottoms)**. The CMMP would also use three transfer sites for temporary storage of materials: **5-748.0-RMT (5.18; Above West Newton)**, **5-745.8-RMT (5.12; Above Fisher Island)** and **5-744.7-LWT (5.08; Lost Island)**. Descriptions of the existing conditions and proposed developments for dredged material placement at these sites are provided in TAB 15 of the CMMP. The impacts of using these sites are summarized below. For additional detail on the impacts of the GREAT I plan and CMMP, the reader should refer to Section 5.0 of this EIS, the GREAT I EIS, the Section 404(b)(1) Evaluation (see Appendix D) and the Biological Assessment (see Appendix C).

B-8.2.3 Impacts of Site Use

5-751.8-LWP - considered, but not selected for CMMP

Site 5-751.8-LWP is located approximately 1 mile below Lock and Dam 4. The site is owned by Dairyland Power Cooperative and is an existing stockpile site near the upstream end of the power generation facility.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, approximately 2 acres of disturbed terrestrial habitat were considered for dredged material placement under the dredged material placement reconnaissance report for pool 5.

a. Little or no impacts on fish and wildlife habitats.
b. No adverse impacts on water quality (mechanical placement).
c. No assessment of impacts on threatened and endangered species completed.
d. No adverse floodplain impacts (site is out of the floodplain and floodway).
e. Minor adverse impacts on recreation (use of site would impair boat landing accessibility).
f. Low potential for cultural resource impacts; site must be coordinated with WISHPO.
g. Minor adverse impacts on socioeconomic resources (aesthetic qualities of river impaired by presence of stockpile).
h. 100 percent beneficial use removal of material projected.
i. Minor adverse impacts on aesthetics.

5-751.5-LWP (5.26; Alma Power Plant) - GREAT I recommended tertiary site

Site 5-751.5-LWP (5.26; Alma Power Plant) is located inside the Alma rail loop approximately 1 mile downstream from Lock and Dam 4. This site, in combination with Site 5-751.5A-LWP, would be used for stockpiling dredged material at the Alma generating station for future rail shipment to other locations for beneficial use. Site 5-751.5-LWP is part of an area created during the 1970s when Dairyland Power constructed a railroad loop. The area was used as a borrow site for material for the dike. The borrow site was shaped to include a variety of habitat including deep marsh, shallow marsh and emergent marsh/wet meadow. The emergent marsh's vegetation consists almost exclusively of reed canarygrass with small stands of cattails.

Acreage affected under GREAT I = this site would not be needed, is no longer available or is a conditional substitute under GREAT I, however, approximately 10 acres of type 1-2 wetlands and 5 acres of type 3-4-5 wetlands (15 acres total) were proposed for use under GREAT I.

a. Substantial adverse impacts on fish and wildlife habitats.
b. Substantial adverse impacts on water quality (in-water rehandling of either hydraulically or mechanically dredged material; turbidity and suspended solids in effluent return water).
c. No assessment of impacts on threatened and endangered species completed.
d. No adverse floodplain impacts (site is out of floodplain and floodway).
e. Minor impacts on recreation (loss of important recreational fishing area).
f. Low potential for cultural resource impacts; site must be coordinated with WISHPO.
g. No adverse social impacts.
h. Access to the site for beneficial use removal of materials is good; no projection of amount removed.
i. Minor adverse impacts on aesthetics.

5-751.2-LWP (5.26A) - GREAT I recommended primary site

Site 5-751.2-LWP (5.26A) is located on the riverward side of the Alma rail loop approximately 1 mile downstream from Lock and Dam 4. The site is a bottomland hardwood area with an average ground elevation approximately 3 feet above low control pool. The site includes shallow marsh, shallow aquatic and bottomland forest habitat. The marsh and shallow aquatic areas are isolated from the UMR by the Dairyland Power rail loop discussed previously. The bottomland forest is rather unusual in that much of the area has a very dense and diverse understory. This diversity and density probably developed because the canopy has been opened up by Dutch elm disease killing off dominant trees.

Acreage affected under GREAT I = this site would not be needed, is no longer available or is a conditional substitute under GREAT I, however, approximately 15 acres of type 1-2 wetlands were proposed for use under GREAT I.

a. Substantial adverse impacts on fish and wildlife habitats.
b. Substantial adverse impacts on water quality (in-water rehandling of either hydraulically or mechanically dredged material; turbidity and suspended solids in effluent return water).
c. No assessment of impacts on threatened and endangered species completed.
d. No adverse floodplain impacts (site is out of floodplain and floodway).
e. No recreation impacts.
f. Potential cultural resource impacts; site must be surveyed and coordinated with WISHPO.
g. No adverse social impacts.
h. Access to the site for beneficial use removal of materials is adequate; however, no projection of potential removal available.
i. Minor adverse impacts on aesthetics.

5-749.8-RMP (5.24; West Newton Chute) - GREAT I recommended secondary site, CMMP selected site

Site 5-749.8-RMP (5.24; West Newton Chute) is a government owned site in an agricultural field located at the upstream end of West Newton Chute. The site has an elevation approximately 20 feet above the river at normal pool. The site is bounded by cropland and a road on three sides. The remaining side is bounded by bottomland forest with a steep bank down to West Newton Chute. The bottomland forest and aquatic areas adjacent to the site enhance the area for wildlife.

Acreage affected under GREAT I = 36 acres of agricultural field habitat.
Acreage affected under CMMP = 39 acres of agricultural field habitat.

a. Minor adverse impacts on fish and wildlife habitats, potential wind erosion impacts on an adjacent proposed State scientific use area.
b. Minor adverse impacts on water quality (in-water rehandling of either hydraulically or mechanically dredged material; turbidity and suspended solids in effluent return water).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. No adverse floodplain impacts (site is out of floodplain and floodway).
e. No recreation impacts.
f. Two cultural resource sites would be affected by site use; coordination with MNSHPO required.
g. Minor adverse social impacts (loss of agricultural lands and degradation of the aesthetic environment).
h. 3 percent beneficial use removal projected under both the CMMP and GREAT I plans.
i. Minor adverse impacts on aesthetics (conversion of farmland to dredged sand pile creates visual intrusion).

5-749.0-RMP (5.21) - considered, but not selected for CMMP

Site 5-749.0-RMP (5.21) is a formerly used dredged material placement site located on an island riverward of West Newton Chute within the UMRWFR. The site includes bottomland hardwoods with numerous sloughs and marshes bordering the site. The area is wooded and the ground elevation is approximately 5 feet higher than low control pool elevation. The site is the type that normally provides valuable habitat for a variety of wildlife species and spawning areas for certain fish species.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, approximately 13 acres of floodplain forest (type 1-2 wetlands) were considered for dredged material placement under the dredged material placement reconnaissance report for pool 5.

a. Minor adverse impacts on fish and wildlife habitats.
b. Minor, short-term adverse impacts on water quality (hydraulic dredging with effluent return; elevated turbidity and suspended solids concentrations).
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. Minor benefits to recreation from creation of open sandy area adjacent to river.
f. Low potential for cultural resource impacts. Site approved by MNSHPO on 11 February 1983.
g. No appreciable social impacts (minor degradation of aesthetics).
h. No beneficial use removal projected.
i. Minor adverse impacts on aesthetics (conversion of river island to dredged sand pile).

5-748.0-RMT (5.18; Above West Newton) - GREAT I recommended emergency site, CMMP selected transfer site

Site 5-748.0-RMT (5.18; Above West Newton) is a previously used island placement site within the Refuge. Habitat on site is limited to old dredged material with little vegetation. Some willows have colonized the site.

Acreage affected under GREAT I = 27.5 acres of old dredged material.
Acreage affected under CMMP = 14 acres of old dredged material.

a. Negligible impacts on fish and wildlife habitats under both plans.
b. Minor, short-term adverse impacts on water quality (hydraulic dredging with effluent return; elevated turbidity and suspended solids concentrations).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. No appreciable impacts on recreation; however, periodic excavation would create temporary harbor-like area for recreational use.

f. No cultural resource impacts. Site approved by MNSHPO on 11 February 1983.
g. No appreciable social impacts (minor degradation of aesthetics).
h. No beneficial use removal projected.
i. Minor adverse impacts on aesthetics (visual intrusion of site on natural river environment).

5-747.5-LWP (5.28; Buffalo City) - GREAT I recommended tertiary site

Site 5-747.5-LWP (5.28; Buffalo City) is a privately owned abandoned sand and gravel quarry located landward of Belvidere Slough. The area is mainly upland with grasses and a few trees vegetating the site. The historic quarrying of the area has resulted in much disturbance, and more recently the site has been used as a dump. Much debris lies in the lower areas of the site. Standing water is present in some of the deeper pits created by sand/gravel mining.

Acreage affected under GREAT I = this site would not be needed, is no longer available or is a conditional substitute under GREAT I, however, approximately 15 acres of abandoned quarry habitat were proposed for use under GREAT I.

a. Negligible adverse impacts on fish and wildlife habitats.
b. Minor adverse impacts on water quality (in-water rehandling of either hydraulically or mechanically dredged material; turbidity and suspended solids in effluent return water).
c. No assessment of impacts on threatened and endangered species completed.
d. No floodplain impacts (site is out of floodplain and floodway).
e. No recreation impacts.
f. Low potential for cultural resource impacts; undisturbed portions of the site must be surveyed and coordinated with WISHPO.
g. No appreciable social impacts.
h. Access to site is adequate for beneficial use removal of materials.
i. No adverse impacts on aesthetics (site is already disturbed).

5-746.6-RMP (5.14) - considered, but not selected for CMMP

Site 5-746.6-RMP (5.14) is located on an island downstream of West Newton Chute. The site is owned by the Federal Government and is a historic placement site last used in the 1970s. Revegetation of the site has occurred. The average ground elevation is 8 feet higher than low control pool. Habitats on site include bottomland forest, old dredged material and a small amount of shallow aquatic habitat. The small amount of aquatic habitat is landlocked and highly disturbed.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, approximately 16 acres of old dredged material were considered for dredged material placement under the dredged material placement reconnaissance report for pool 5.

a. Little or no impacts on fish and wildlife habitats.
b. Minor adverse impacts on water quality (hydraulic dredging with effluent return; elevated turbidity and suspended solids concentrations in the range of 40 to 110 ppm).
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts (site is in the floodplain and floodway).
e. Benefits to recreation from creation of sandy beach area adjacent to river.
f. No cultural resource impacts.
g. No appreciable social impacts.
h. No beneficial use removal projected.
i. Minor adverse impacts on aesthetics.

5-745.8-RMT (5.12; Above Fisher Island) - GREAT I recommended emergency site, CMMP selected transfer site

Site 5-745.8-RMT (5.12; Above Fisher Island) is also an existing containment area used extensively in the past for placement of dredged materials. As with Site 5-744.7-LWT, this site was excavated and the material used for the Weaver Bottoms Environmental Management Program (EMP) project in 1986. A large bathtub area, approximately 14 acres, was created when the site was excavated.

Acreage affected under GREAT I = 5.5 acres of old dredged material.
Acreage affected under CMMP = 14 acres of old dredged material.

a. Little or no impacts on fish and wildlife habitats.
b. Minor adverse impacts on water quality (hydraulic dredging with effluent return; elevated turbidity and suspended solids concentrations).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. No appreciable impacts on recreation; however, periodic excavation would create temporary harbor-like area for recreational use.
f. No cultural resource impacts.
g. No appreciable social impacts.
h. No beneficial use removal projected (site would be used for emergency placement under GREAT I and as a temporary transfer site under the CMMP).
i. Minor adverse impacts on aesthetics (continued use of site would not increase visual impacts of existing site).

5-744.7-LWT (5.08; Lost Island) - CMMP selected transfer site

Site 5-744.7-LWT (5.08; Lost Island) is an island containment site that has been used extensively in the past for dredged material placement. Material was removed from this site and used for the Weaver Bottoms EMP project in 1986. During this transfer operation a large "bathtub" of open water was created.

Acreage affected under CMMP = 18 acres of old dredged material.

a. Little or no impacts on fish and wildlife habitats.
b. Minor adverse impacts on water quality (hydraulic dredging with effluent return; elevated turbidity and suspended solids concentrations).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. No appreciable impacts on recreation; however, periodic excavation would create temporary harbor-like area for recreational use.
f. No cultural resource impacts.
g. No appreciable social impacts.
h. No beneficial use removal projected (site would be used as a transfer site).
i. Minor adverse impacts on aesthetics (continued use of site would not increase visual impacts).

5-744.0-RMP (5.30; Weaver Bottoms) - GREAT I recommended primary site, CMMP selected site

Site 5-744.0-RMP (5.30; Weaver Bottoms) is the permanent placement site for materials rehandled from Sites 5-744.7-LWT and 5-745.8-RMT. Weaver Bottoms consists of multiple placement sites including side channel closures and new islands.

Acreage affected under GREAT I = 76 acres of type 3-4-5 wetlands.
Acreage affected under CMMP = 108 acres of type 3-4-5 wetlands.

a. Substantial adverse impacts on fish and wildlife habitats, however, the placement of materials in Weaver Bottoms would occur (has occurred) as part of an environmental enhancement project for the area. The creation of islands and closing of side channels with dredged material would significantly improve fish and wildlife habitats in the Weaver Bottoms complex.
b. Minor adverse impacts on water quality associated with hydraulic placement and resulting effluent; no impacts on water quality if mechanical placement employed.
c. No adverse impacts on Federal threatened and endangered species.
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. Benefits to recreation from creation of sandy beach areas and enhancement of fish and wildlife resources.
f. No cultural resource impacts.
g. Minor benefits to social resources (enhancement of fish and wildlife resources for recreation).
h. No beneficial use removal projected; material used for passive benefits.
i. No adverse impacts on aesthetics.

B-8.2.4 Comparison of Plans

Both the GREAT I plan and the CMMP for pool 5 would have minor adverse effects on water quality (Tables B-25 and B-26). The main channel sediments in pool 5 are relatively uncontaminated, and most dredging events are of short duration (2 to 3 days).

Both plans have the potential to significantly benefit fish and wildlife habitats in pool 5, primarily because of the presence of the Weaver Bottoms project in both plans. The Weaver Bottoms project could significantly improve habitat diversity and interspersion in pool 5. However, substantial loss of aquatic and wetland areas would also occur under both plans. In total, 76 acres of shallow/deep marsh, 33 acres of old dredged material and 36 acres of agricultural field habitat would be disturbed in pool 5 under the GREAT I plan. Comparable figures under the CMMP include: 108 acres of wetland/terrestrial habitats in Weaver Bottoms, 46 acres of old dredged material and 39 acres of agricultural field habitat.

Other than Site 5-749.8-RMP (5.24; West Newton Chute), which is proposed under both plans, there is little difference between the GREAT I and CMMP plans and potential effects on cultural resources. Site 5-749.8-RMP has the potential for a National Register of Historic Places site and must be carefully evaluated.

SITE	GREAT	CMMP	SECTION 106 STATUS
5-749.8-RMP (5.24; West Newt. Chute)	X	X	National Reg. assess. needed
5-748.0-RMT (5.18; Above W. Newt.)	X	X	Approved
5-745.8-RMT (5.12; Above Fisher Isl.)	X	X	Approved
5-744.7-LWT (5.08; Lost Island)		X	Coordination required
5-744.0-RMP (5.30; Weaver Bottoms)	X	X	Approved use of disturbed areas

GREAT 4 disposal sites

3 approved
0 require surveys
1 requires further coordination (National Register assessment needed)

CMMP 5 disposal sites

3 approved
0 require further survey work
2 require further coordination (one for National Register assessment)

Table B-25. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

POOL 5 - GREAT

	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values					X		
3. Recreational Opportunities				X			
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use					X		
10. Controversy				X			
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services				X			
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply			X				
8. Commercial Navigation			X				
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands				X			
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				U*			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

Table B-26. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

POOL 5 - CMMP

	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values					X		
3. Recreational Opportunities				X			
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use					X		
10. Controversy				X			
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services				X			
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply			X				
8. Commercial Navigation			X				
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands				X			
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				X			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

B-9.0 POOL 5A

B-9.1 SITE SPECIFIC IMPACTS OF DREDGING

B-9.1.1 GREAT I Channel Maintenance Plan

Placement site planning was completed for six dredge cuts in pool 5A (Table B-27). An estimated 2,369,500 cubic yards of material would be dredged from these cuts over the next 40 years.

B-9.1.2 CMMP

Based on historical dredging patterns and current criteria for implementing maintenance dredging, the Upper Approach to L/D 5A and the Lower Approach to L/D 5 cuts were placed on the inactive list. An estimated 1,868,500 cubic yards of material would be dredged from pool 5A under the CMMP.

Table B-27. Dredge cuts, Pool 5A.

Pool-Cut #	Cut Name	Location (RM)	GREAT I Status	CMMP Status
5A-6	Lower Approach to L/D 5	737.7 to 738.1	Active	Inactive
5A-5	Island 58	734.0 to 731	Active	Active
5A-4	Fountain City	733.3 to 733.8	Active	Active
5A-3	Betsy Slough	731.0 to 732.0	Active	Active
5A-2	Wild's Bend	730.2 to 730.7	Active	Active
5A-1	Upper Approach to L/D 5A	728.5 to 729.5	Active	Inactive

B-9.1.3 Impacts of Dredging

The impacts of dredging pool 5A are summarized below.

Acreage affected under GREAT I = 235.8 acres of main channel habitat.
Acreage affected under CMMP = 184.8 acres of main channel habitat.

a. Substantial adverse impacts on main channel habitats, benthic invertebrates and fish.
b. Negligible impacts on water quality (sediments are uncontaminated, medium to coarse sands).
c. Minor to substantial adverse impacts on freshwater mussels (mussel resources are degraded but recovering).
d. No determination of the effects of dredging cuts 5A-5 and 5A-4 on Federal threatened or endangered species (mussel surveys and coordination required; see Appendix C). No adverse impacts on Federal threatened and endangered species from maintaining remaining active cuts.

e. Minor, short-term adverse impacts on recreation (recreational craft temporarily displaced or prohibited from dredge cut location).
f. No cultural resources affected.
g. No appreciable social impacts (potential for short-term delays to commercial navigation).

B-9.1.4 Comparison of Plans

Neither plan would have any significant adverse water quality impacts (Tables B-28 and B-29) because the main channel sediments in pool 5A are relatively uncontaminated and most impact events would be 2 to 3 days in duration.

The GREAT I plan would affect approximately 51 acres more of main channel habitat than the CMMP. The CMMP would have no effects on threatened and endangered species (Table B-29). Dredging under the CMMP would likely not affect Federal threatened or endangered species, however, mussel surveys in two cuts and coordination of survey results with the USFWS will be necessary to confirm this determination. Dredging under the GREAT I plan has not been assessed for impacts on threatened and endangered species (Table B-28).

B-9.2 SITE-SPECIFIC IMPACTS OF DREDGED MATERIAL PLACEMENT

B-9.2.1 GREAT I Channel Maintenance Plan

The GREAT I study evaluated 12 sites for potential placement of materials dredged from pool 5A. The evaluation of impacts of use of alternative sites considered by GREAT I, as well as justification for recommending placement sites for pool 5A, is provided on pages 127-130 of the GREAT I EIS (Volume 9 of the GREAT I Technical Appendices) and incorporated by reference in this document. The GREAT I plan for placement of materials dredged from pool 5A recommended the following primary sites: **5A-737.5-RMP (5A.23; Bass Camp), 5A - 731.9-LWP (5A.25; Fountain City 1)** and **5A-731.8-LWP (5A.32; Fountain City 2)**. Site **5A-738.2-RMP (5A.36; L/D 5 Site)** was recommended as a secondary site. Two emergency sites were recommended by GREAT I: **5A-734.5-LWE (5A.14; Island 58)** and **5A-730.5-LWT (5A.08; Wilds Bend)**. Descriptions of the existing conditions and site development impacts for the selected GREAT I sites are provided in Volume 8 of the Technical Appendices of the GREAT I study. The impacts of using the GREAT I selected sites are summarized below.

B-9.2.2 CMMP

In subsequent planning for implementation of the GREAT I plan, all the GREAT I recommended sites listed above and one site not evaluated by GREAT I (5A-733.5-LWP (Fountain City Service Base)) were evaluated as potential dredged material placement sites.

The CMMP for pool 5 would use the following sites for permanent placement of materials: **5A-738.2-RMP (5A.36; L/D 5 Site), 5A-733.5-LWP (Fountain City Service Base), 5A-731.9-**

LWP (5A.25; Fountain City 1) and **5A-731.8-LWP (5A.32; Fountain City 2)**. The CMMP would use **5A-734.5-LWE (5A.14; Island 58)** as an emergency site and **5A-730.5-LWT (5A.08; Wilds Bend)** as a transfer site. Descriptions of the existing conditions and proposed developments for dredged material placement at these sites are provided in TAB 16 of the CMMP. The impacts of using these sites are summarized below. For additional detail on the impacts of the GREAT I plan and CMMP, the reader should refer to Section 5.0 of this EIS, the GREAT I EIS, the Section 404(b)(1) Evaluation (see Appendix D) and the Biological Assessment (see Appendix C).

B-9.2.3 Impacts of Site Use

5A-738.2-RMP (5A.36; L/D 5 Site) - GREAT I recommended secondary site, CMMP selected site

Site 5A-738.2-RMP (5A.36; L/D 5 Site) is located adjacent to the lower guidewall of Lock and Dam 5. The site is partially bottomland hardwoods and partially old dredged material. It is the former site of some residential buildings of the lock and dam complex.

Acreage affected under GREAT I = 1 acre of type 1-2 wetland and 1 acre of old dredged material; 2 acres total.
Acreage affected under CMMP = 1 acre of type 1-2 wetland and 1 acre of old dredged material; 2 acres total.

a. No adverse impacts on fish and wildlife habitats.
b. No adverse impacts on water quality (mechanical placement).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. No adverse floodplain impacts (site is within floodplain but out of floodway).
e. No adverse impacts on recreation.
f. No adverse impacts on cultural resources.
g. No appreciable social impacts.
h. 100 percent beneficial use removal projected under both GREAT I (49,500 c.y.) and CMMP (80,000 c.y.).
i. No adverse impacts on aesthetics.

5A-737.5-RMP (5A.23; Bass Camp) - GREAT I recommended primary site

Site 5A-737.5-RMP (5A.23; Bass Camp) is located about 0.5 mile below Lock and Dam 5 adjacent to the Bass Camp campground. Ownership is part Federal and part private. Vegetation at the site is predominantly bottomland hardwoods. The site is currently used by fish and wildlife as a waterfowl nesting and fish spawning area. A privately owned and operated campground is located adjacent to the proposed dredged material placement site.

Acreage affected under GREAT I = 7 acres of type 1-2 wetlands.

a. Minor adverse impacts on fish and wildlife habitats.
b. No adverse water quality impacts (mechanical placement).
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts (fill material placed within floodplain and floodway).
e. Minor benefits to recreation (material used for development of adjacent recreation facility).
f. Low potential for adverse impacts on cultural resources. Site verbally approved by MNSHPO on 17 November 1982.
g. No appreciable social impacts (minor degradation of aesthetic environment; minor socioeconomic benefits if material is used for development of recreation facility).
h. 2 percent (15,500 c.y.) beneficial use removal of materials projected.
i. Minor adverse impacts on aesthetics (visual intrusion of dredged sand pile on riverbank setting).

5A-734.5-LWE (5A.14; Island 58) - GREAT I recommended emergency site, CMMP selected emergency site

Site 5A-734.5-LWE (5A.14; Island 58) is Federally owned and was formerly used for dredged material placement. The site is a forested area with a mix of bottomland hardwoods and old dredged material present.

Acreage affected under GREAT I = 7 acres of old dredged material.
Acreage affected under CMMP = 3 acres of old dredged material.

a. Minor adverse impacts on fish and wildlife habitats under GREAT I, no adverse impacts on fish and wildlife habitats under CMMP.
b. Minor, short-term adverse impacts on water quality (hydraulic dredging with effluent; elevated turbidity and suspended solids in the range of 40 to 110 ppm in effluent return water).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse floodplain impacts (fill material placed within the floodplain and floodway).
e. Minor beneficial impacts on recreation (creation of a sandy beach area).
f. Low potential for adverse impacts on cultural resources. Site verbally approved by WISHPO on 14 May 1986.
g. No adverse social impacts.
h. No beneficial use removal projected (site would be used for emergency placement under GREAT I and as an emergency site under the CMMP).
i. Minor adverse impacts on aesthetics (previous use of site limits potential impacts on aesthetics).

5A-733.5-LWP (Fountain City Service Base) - CMMP selected site

Site 5A-733.5-LWP (Fountain City Service Base) is located on the left bank of the river immediately above Fountain City. The site consists of a strip of bottomland forest with the

remainder being wetlands and open aquatic habitat. The site is almost entirely bounded by open water and deep marsh.

Acreage affected under CMMP = 2 acres of side channel habitat.

a. Minor adverse impact on fish and wildlife habitats
b. Minor adverse impact on water quality; site will be used to sequester sediment with low levels (0.8 to 5 ppm) of PCB contamination.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse floodplain impacts (fill material placed within the floodplain and floodway).
e. No adverse impacts on recreation.
f. Low potential for adverse impacts on cultural resources. Site approved by WISHPO on 18 May 1982.
g. Minor beneficial impact on socioeconomic resources (material used in Fountain City Service Base expansion project).
h. No beneficial use removal projected (material use on site considered passive beneficial use).
i. No adverse impacts on aesthetics (adjacent site uses limit potential impacts).

5A-731.9-LWP (5A.25; Fountain City 1) - GREAT I recommended primary site, CMMP selected site

Site 5A-731.9-LWP (5A.25; Fountain City 1) is a riparian site on the left bank of the river. At one time, the site was probably floodplain forest; however, it has been used extensively for stockpiling of dredged material and now consists of small areas of forest vegetation broken up by piles of dredged material.

Acreage affected under GREAT I = 6 acres of old dredged material.
Acreage affected under CMMP = 6 acres of old dredged material.

a. Minor adverse impacts on fish and wildlife habitats under both plans.
b. Minor adverse impacts on water quality (hydraulic placement of uncontaminated materials; effluent discharged to river with elevated turbidity and suspended solids concentrations).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse floodplain impacts (fill material placed within the floodplain and floodway).
e. No adverse impacts on recreation.
f. Low potential for adverse impacts on cultural resources. Site approved by WISHPO on 28 July 1981.
g. No adverse social impacts.
h. 15 percent (40,000 c.y.) beneficial use removal projected under GREAT I; 91 percent (864,000 c.y.) beneficial use removal projected under the CMMP.
i. No adverse impacts on aesthetics (site is already disturbed).

5A-731.8-LWP (5A.32; Fountain City 2) - GREAT I recommended primary site, CMMP selected site

Site 5A-731.8-LWP (5A.32; Fountain City 2) is owned by the city of Fountain City and lies between State Highway 35 and the Burlington Northern Railroad tracks. The site has a variety of wetland and aquatic habitats, the most common being floodplain forest, shallow emergent marsh and shallow aquatic areas. The shallow marsh areas are predominantly vegetated by arrowhead, rice cutgrass, cattails, sedges and bulrushes. The shallow aquatic areas are 1 to 3 feet deep during the summer and contain aquatic plants such as white water lily, coontail and pondweeds.

Acreage affected under GREAT I = 5 acres of type 1-2 wetlands and 29 acres of type 3-4-5 wetlands; 34 acres total.
Acreage affected under CMMP = 8 acres of type 1-2 wetlands and 14 acres of type 3-4-5 wetlands; 22 acres total.

a. Substantial adverse impacts on fish and wildlife habitat under both plans, use of site is opposed by US Fish and Wildlife Service and Wisconsin Department of Natural Resources.
b. No adverse surface water quality impacts (mechanical placement and hydraulic placement with little or no effluent return; effluent return through wetland area); potential adverse impacts on groundwater.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Potential minor adverse floodplain impacts (fill material placed within the floodplain but out of floodway).
e. No adverse impacts on recreation.
f. Moderate potential for adverse impacts on cultural resources; site must be surveyed and coordinated with WISHPO.
g. Minor adverse social impacts (safety and aesthetic impacts associated with location of site in relation to residential areas).
h. No beneficial use removal of materials projected.
i. Minor adverse impacts on aesthetics (conversion of natural wetland areas to dredged material piles).

5A-730.5-LWT (5A.08; Wilds Bend) - GREAT I recommended emergency site, CMMP selected transfer site

Site 5A-730.5-LWT (5A.08; Wilds Bend) is federally owned and lies within the UMRWFR. GREAT I described the site as covering 15 acres in two locations on a peninsula. This site has historically been used for dredged material placement; consequently, the habitat on-site reflects this use. Habitat at the site includes a combination of old dredged material and floodplain forest.

Acreage affected under GREAT I = 5 acres of type 1-2 wetlands and 4 acres of old dredged material; 9 acres total.
Acreage affected under CMMP = 8 acres of old dredged material.

a. Minor adverse impacts on fish and wildlife habitat under both plans.
b. Minor short-term adverse impacts on water quality (hydraulic dredging with effluent; elevated turbidity and suspended solids in the range of 40 to 110 ppm in effluent return water).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse floodplain impacts (fill material placed within the floodplain and floodway).
e. No appreciable impacts on recreation; however, periodic excavation would create temporary harbor-like area for recreational use.
f. No adverse impacts on cultural resources. Site approved by WISHPO on 7 August 1984.
g. No adverse impacts on socioeconomic resources.
h. No beneficial use removal projected (site would be used for emergency placement under GREAT I and as a temporary transfer site under the CMMP).
i. No adverse impacts on aesthetics (site is already disturbed).

B-9.2.4 Comparison of Plans

Neither plan would have any significant adverse water quality impacts because the main channel sediments in pool 5A are relatively uncontaminated and most impact events would be 2 to 3 days in duration (Table B-28 and B-29). Under the GREAT I plan, approximately 1,104,000 cubic yards (59 percent of total) would be mechanically dredged. The comparable figure for the CMMP is 1,511,500 cubic yards (80 percent of total). From a water quality perspective, the CMMP provides for more mechanical placement and would be preferred over the GREAT I plan.

The GREAT I plan would result in the disturbance of 18 acres of floodplain forest habitat, 29 acres of shallow/deep emergent marsh habitat and 18 acres of old dredged material. The CMMP would result in the disturbance of 9 acres of floodplain forest habitat, 14 acres of shallow/deep emergent marsh habitat, 2 acres of aquatic habitat and 18 acres of old dredged material. The loss of wetland habitat would be greater under the GREAT I plan.

It is unlikely that use of any sites would affect cultural resources under either the GREAT plan or the CMMP. Site 5A-738.2-RMP (5A.36; L/D 5 Site) would require coordination. The lands around this site were probably disturbed during construction of the lock and dam.

SITE	GREAT	CMMP	SECTION 106 STATUS
5A-738.2-RMP (5A.36; L/D 5 Site)	X	X	Coordination required
5A-737.5-RMP (5A.23; Bass Camp)	X		Approved
5A-734.5-LWE (5A.14; Island 58)	X	X	Approved
5A-733.5-LWP (Ft. City Serv. Base)		X	Approved
5A-731.9-LWP (5A.25; Ft. City 1)	X	X	Approved
5A-731.8-LWP (5A.32; Ft. City 2)	X	X	Approved
5A-730.5-LWT (5A.08; Wilds Bend)	X	X	Approved

GREAT 6 disposal sites

5 approved
0 require surveys
1 requires coordination

CMMP 6 disposal sites

5 approved
0 require further survey work
1 requires coordination

Table B-28. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

POOL 5A - GREAT

PARAMETER	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values					X		
3. Recreational Opportunities				X			
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use				X			
10. Controversy				X			
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services				X			
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply			X				
8. Commercial Navigation			X				
9. Floodplain Effects					X		
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands						X	
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				U*			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

Table B-29. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

POOL 5A - CMMP

	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values					X		
3. Recreational Opportunities				X			
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use				X			
10. Controversy				X			
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services				X			
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply			X				
8. Commercial Navigation			X				
9. Floodplain Effects					X		
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands						X	
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				X			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

B-10.0 POOL 6

B-10.1 SITE-SPECIFIC IMPACTS OF DREDGING

B-10.1.1 GREAT I Channel Maintenance Plan

Long-term channel maintenance planning was completed for six dredge cuts located in pool 6 (Table B-30). An estimated total volume of 1,184,500 cubic yards of material would be removed from pool 6 over the 40-year planning period under GREAT I.

B-10.1.2 CMMP

Based on historical dredging patterns and current criteria for implementing maintenance dredging, the Above Winona Railroad Bridge, Island 71 and Lower Approach to L/D 5A cuts are considered inactive. An estimated total volume of 786,500 cubic yards of material would be dredged from pool 6 under the CMMP.

Table B-30. Dredge cuts, Pool 6.

Pool-Cut #	Cut Name	Location (RM)	GREAT I Status	CMMP Status
6-6	Lower Approach to L/D 5A	728.5	Active	Inactive
6-5	Island 71 and Boat Harbor	726.0 to 726.5	Active	Inactive
6-4	Above Winona Railroad Bridge	723.9 to 724.2	Active	Inactive
6-3	Below Winona Railroad Bridge	723.4 to 723.8	Active	Active
6-2	Gravel Point	721.8 to 722.9	Active	Active
6-1	Homer	720.4 to 721.1	Active	Active

B-10.1.3 Impacts of Dredging

The impacts of dredging in pool 6 are summarized below.

Acreage affected under GREAT I = 148.5 acres of main channel habitat.
Acreage affected under CMMP = 106.7 acres of main channel habitat.

a. Substantial disturbance to main channel habitats, benthic invertebrates and fish.
b. Negligible impacts on water quality (sediments are uncontaminated, fine to medium sands).
c. Minor adverse impacts on freshwater mussels (mussel resources are healthy but sparsely distributed).
d. No determination of the effects of dredging cut 6-2 on Federal threatened or endangered species (mussel survey and coordination required; see Appendix C). No adverse impacts on Federal threatened or endangered species from dredging remaining active cuts.
e. Minor, short-term adverse impacts on recreation (recreational craft temporarily displaced or prohibited from dredge cut locations).

f. No adverse impacts on cultural resources.
g. No appreciable adverse impacts on socioeconomic resources (potential short-term delays to commercial navigation).

B-10.1.4 Comparison of Plans

Neither the GREAT I nor the CMMP would have any significant adverse water quality impacts (Tables B-31 and B-32). The main channel sediments in pool 6 are relatively uncontaminated, and most impact events would be of short duration.

The GREAT I plan would affect 148.5 acres of main channel aquatic habitat, while the CMMP would affect 106.7. Dredging under the CMMP would likely not affect Federal threatened and endangered species, however, further mussel surveys in the Gravel Point cut and coordination of survey results with the USFWS are necessary to confirm this determination. The impacts of dredging under the GREAT I plan on threatened and endangered species have not been assessed.

B-10.2 SITE-SPECIFIC IMPACTS OF DREDGED MATERIAL PLACEMENT

B-10.2.1 GREAT I Channel Maintenance Plan

The GREAT I study evaluated six sites for placement of materials dredged from pool 6. The evaluation of impacts of all alternatives considered by GREAT I, as well as justification for recommending placement sites for pool 6, is provided on pages 131-132 of the GREAT I EIS (Volume 9 of the GREAT I Technical Appendices) and incorporated by reference here. GREAT I recommended the following sites as primary sites for placement of dredged materials from pool 6: **6-726.0-LMP (6.27; Winona Small Boat Harbor), 6-724.5-RMP (6.19/6.20)** and **6-723.3-RMP (6.17; Winona Industrial Park)**. Site **6-720.5-RMP (6.11; Homer)** was recommended as a secondary site. Descriptions of the existing conditions and site development impacts for the selected GREAT I sites are provided in Volume 8 of the Technical Appendices of the GREAT I study. The impacts of using the sites selected by GREAT I are summarized below.

B-10.2.2 CMMP

In subsequent planning for implementation of the GREAT I plan, all the GREAT I recommended sites (listed above) and one site not evaluated by GREAT I (6-726.3-RMP (Winona Commercial Harbor)) were evaluated as potential dredged material placement sites. The CMMP for pool 6 would use four permanent placement sites: **6-720.5-RMP (6.11; Homer), 6-723.3-RMP (6.17; Winona Industrial Park), 6-726.3-RMP (Winona Commercial Harbor)** and **6-726.0-LMP (6.27; Winona Small Boat Harbor)**. Descriptions of the existing conditions and proposed developments for dredged material placement at these sites are provided in TAB 16 of the CMMP. The impacts of using these sites are summarized below. For additional detail on the

impacts of the GREAT I plan and CMMP, the reader should refer to Section 5.0 of this EIS, the GREAT I EIS, the Section 404(b)(1) Evaluation (see Appendix D) and the Biological Assessment (see Appendix C).

B-10.2.3 Impacts of Site Use

6-726.3-RMP (Winona Commercial Harbor) - CMMP selected site

Site 6-726.3-RMP (Winona Commercial Harbor) is an existing stockpile site located adjacent to the Winona commercial boat harbor. It has been used for dredged material stockpiling and habitat on-site reflects this disturbance.

Acreage affected under CMMP = 6 acres of disturbed terrestrial habitat.

a. No adverse impacts on fish and wildlife habitat.
b. No adverse impacts on water quality (mechanical placement).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. No adverse floodplain impacts (site is out of the floodplain and floodway).
e. No adverse impacts on recreation.
f. No adverse impacts on cultural resources.
g. No adverse impacts on socioeconomic resources; minor benefits to City of Winona.
h. 100 percent (434,000 c.y.) beneficial use removal of material projected.
i. No adverse impacts on aesthetics (site is already disturbed).

6-726.0-LMP (6.27; Winona Small-Boat Harbor) - GREAT I recommended primary site, CMMP selected site

Site 6-726.0-LMP (6.27; Winona Small-Boat Harbor) is an existing stockpile site located adjacent to the Winona small-boat harbor. The site is highly disturbed from past placement activities.

Acreage affected under GREAT I = 0.5 acre of old dredged material.
Acreage affected under CMMP = 1 acre of old dredged material.

a. No adverse impacts on fish and wildlife habitat under either plan.
b. No adverse impacts on water quality (mechanical placement).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. No adverse impacts on recreation.
f. No adverse impacts on cultural resources.
g. No adverse impacts on socioeconomic resources; minor benefits to the city of Winona.
h. 100 percent (227,000 c.y.) beneficial use removal of material projected.
i. No adverse impacts on aesthetics.

6-724.5-RMP (6.19/6.20) - GREAT I recommended primary sites

Site 6-724.5-RMP (6.19/6.20) covers two 2.5-acre areas in Winona, Minnesota. Near the river, but behind the flood levee, the two areas are highly disturbed and both have been used in the past for placement.

Acreage affected under GREAT I = 5 acres of old dredged material.

a. No adverse impacts on fish and wildlife habitat.
b. No adverse impacts on water quality (mechanical placement).
c. No assessment of impacts on threatened and endangered species completed.
d. No adverse floodplain impacts (site is out of the floodplain and floodway).
e. No adverse impacts on recreation.
f. No adverse impacts on cultural resources.
g. Minor adverse impacts on socioeconomic resources (increased truck traffic through portions of Winona, MN).
h. 100 percent (171,000 c.y.) beneficial use removal of material projected.
i. No adverse impacts on aesthetics.

6-723.3-RMP (6.17; Winona Industrial Park) - GREAT I recommended primary site, CMMP selected site

Site 6-723.3-RMP (6.17; Winona Industrial Park) is located in the Winona Industrial Park approximately 3,000 feet from the river. The site is a mixture of meadow, herbaceous wetland, willow shrub, and bottomland forest habitat. Material was provided for the development of this site after the city of Winona obtained all necessary Federal, State, and local permits required for filling. Filling of the site has been completed.

Acreage affected under GREAT I = 21 acres of type 1-2 and 3-4-5 wetlands.

a. Substantial adverse impacts on fish and wildlife habitats
b. Minor adverse impacts on water quality (in-water hydraulic rehandling; effluent return water discharged to river with elevated turbidity and suspended solids concentrations).
c. No adverse impacts on Federal threatened and endangered species.
d. No adverse floodplain impacts (site is out of the floodplain and floodway).
e. No adverse impacts on recreation.
f. No adverse impacts on cultural resources. Wetland site with low potential for cultural resource deposits. Site surveyed in 1975 with negative results.
g. Minor beneficial impacts on socioeconomic resources (material used in development of the Winona Industrial Park).
h. No beneficial use removal projected; however, use of material on-site considered passive beneficial use (fill material for Winona Industrial Park).
i. Minor adverse impacts on aesthetics.

6-720.5-RMP (6.11; Homer) - GREAT I recommended secondary site, CMMP selected site

Site 6-720.5-RMP (6.11; Homer) is located near Homer, Minnesota. This site is primarily bottomland forest in character, with some areas disturbed by past dredged material placement.

Acreage affected under GREAT I = 9 acres of type 1-2 wetlands and 2 acres of old dredged material; 11 acres total.
Acreage affected under CMMP = 8 acres of type 1-2 wetlands and 2 acres of old dredged material; 10 acres total.

a. Minor adverse impacts on fish and wildlife habitat under either plan.
b. Minor adverse impacts on surface water quality associated with hydraulic placement and resulting effluent return water; potential adverse impacts on groundwater.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. Minor beneficial impacts on recreation (maintenance of sandy beach area adjacent to river).
f. No adverse impacts on cultural resources. Site surveyed in 1975 with negative results.
g. Minor adverse impacts on socioeconomic resources (degradation of the aesthetic, scenic environment; safety concerns associated with presence of a private residence only 200 feet from the site).
h. 100 percent beneficial removal of material projected under GREAT I (272,500 c.y.) and CMMP (352,500 c.y.).
i. Minor adverse impacts on aesthetics.

B-10.2.4 Comparison of Plans

Neither the GREAT I nor the CMMP would have any significant adverse water quality impacts (Tables B-31 and B-32). The main channel sediments in pool 6 are relatively uncontaminated, and most impact events would be of short duration.

The GREAT I plan would affect 9 acres of floodplain forest and 7.5 acres of old dredged material. The CMMP would have an impact on 8 acres of floodplain forest, 3 acres of old dredged material and 6 acres of disturbed terrestrial habitat.

In each case, 2 of the 3 dredged material placement sites would require further coordination, and in each case, the likelihood of finding cultural resources is small. While we need to complete the coordination to make our final determination, it appears that neither plan would significantly affect cultural resources.

SITE	GREAT	CMMP	SECTION 106 STATUS
6-726.3-RMP (Winona Comm. Hbr.)		X	Need to coordinate, cult. res. unlikely.
6-726.0-LMP (6.27; Winona Hbr.)		X	No adverse impacts.
6-724.5-RMP (6.19)	X		No adverse impacts.
6-723.3-RMP (6.17)	X		Approved
6-720.5-RMP (6.11; Homer)	X	X	Need to coordinate, cult. res. unlikely

GREAT 3 disposal sites

2 approved
0 require surveys
1 require coordination

CMMP 3 disposal sites

1 approved
0 require further survey work
2 require coordination

Table B-31. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

POOL 6 - GREAT

	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values					X		
3. Recreational Opportunities				X			
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use			X				
10. Controversy				X			
B. ECONOMIC EFFECTS							
1. Property Values			X				
2. Tax Revenues			X				
3. Public Facilities and Services				X			
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply			X				
8. Commercial Navigation			X				
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands				X			
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				U*			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

Table B-32. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

POOL 6 - CMMP

PARAMETER	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE EFFECT	ADVERSE EFFECT		
	SIGNIFICANT	SUBSTANTIAL	MINOR		MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values					X		
3. Recreational Opportunities				X			
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use			X				
10. Controversy				X			
B. ECONOMIC EFFECTS							
1. Property Values			X				
2. Tax Revenues			X				
3. Public Facilities and Services				X			
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply			X				
8. Commercial Navigation			X				
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands					X		
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				X	U*		
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

B-11.0 POOL 7

B-11.1 SITE-SPECIFIC IMPACTS OF DREDGING

B-11.1.1 GREAT I Channel Maintenance Plan

Seven historic dredge cuts are located in pool 7. All cuts were considered active under the GREAT I plan (Table B-33). An estimated 2,172,500 cubic yards of material would be removed from pool 7 over the next 40 years under the GREAT I plan.

B-11.1.2 CMMP

Based on historical dredging patterns and current criteria for implementing maintenance dredging, the Below Queen's Bluff cut was placed on the inactive list (Table B-33). Also, to facilitate material placement planning, the Dresbach Island cut was divided into two separate cuts. An estimated 2,087,000 cubic yards of material would be removed from pool 7 over the next 40 years under the CMMP.

Table B-33. Dredge cuts, Pool 7.

Pool-Cut #	Cut Name	Location (RM)	GREAT I Status	CMMP Status
7-7	Lower Approach to L/D 6	714.0 to 714.3	Active	Active
7-6	Richmond Island	711.4 to 712.3	Active	Active
7-5	Below Queen's Bluff	710.3 to 710.7	Active	Inactive
7-4	Winter's Landing	707.4 to 709.3	Active	Active
7-3	Dakota	706.1 to 706.6	Active	Active
7-2B*	Head of Dresbach	704.0 to 705.3	Active	Active
7-2A*	Lower Dresbach Island	703.0 to 703.7	Active	Active
7-1	Upper Approach to L/D 7	702.5 to 702.9	Active	Active

* The Head of Dresbach and Lower Dresbach Island cuts were considered one cut under GREAT I.

B-11.1.3 Impacts of Dredging

The impacts of dredging in pool 7 are summarized below.

Acreage affected under GREAT = 287.9 acres of main channel habitat.
Acreage affected under CMMP = 263.7 acres of main channel habitat.

a. Substantial disturbance to main channel habitats, benthic invertebrates and fish.
b. Minor impacts on water quality (sediments are uncontaminated, medium sands).
c. Minor to substantial adverse impacts on freshwater mussels (mussel resources are healthy, but generally not located within main channel dredge cuts).

d. No determination of the effects of dredging cuts 7-6 and 7-1 on Federal threatened or endangered species (mussel surveys and coordination required; see Appendix C). No adverse impacts on Federal threatened or endangered species from maintaining remaining active cuts.
e. Minor, short-term adverse impacts on recreation (temporary displacement of recreational craft).
f. No adverse impacts on cultural resources.
g. No appreciable adverse impacts on socioeconomic resources (potential short-term delays to commercial navigation).

B-11.1.4 Comparison of Plans

Neither plan would be expected to have any significant adverse water quality impacts (Tables B-34 and B-35), because the main channel sediments in pool 7 are relatively uncontaminated and most impact events would be 2 to 3 days in duration.

Dredging under both plans would have substantial adverse effects on fish and wildlife habitats; however, the GREAT I plan potentially affects about 14 acres more of main channel aquatic habitat than the CMMP. Dredging under the CMMP would be unlikely to affect Federal threatened or endangered species, however, mussel surveys in the Richmond Island and Upper Approach to L/D 7 cuts and coordination of survey results with the USFWS will be necessary to confirm this determination. The effects of the GREAT I plan on Federal threatened and endangered species have not been assessed.

B-11.2 SITE-SPECIFIC IMPACTS OF DREDGED MATERIAL PLACEMENT

B-11.2.1 GREAT I Channel Maintenance Plan

The GREAT I study evaluated nine sites as potential dredged material placement sites in pool 7. The evaluation of impacts of use of all alternative sites considered by GREAT I, as well as justification for recommending placement sites for pool 7, is provided on pages 133-136 of the GREAT I EIS (Volume 9 of the GREAT I Technical Appendices). Those evaluations are incorporated by reference in this document. The GREAT I plan for management of materials dredged from pool 7 recommended three primary sites: **7-714.1-LWP (7.06; Trempealeau), 7-713.1-RMP (7.05; Hot Fish Shop)** and **7-702.5-RMP (7.20)**. Site **7-705.2-RMP (7.01)** was recommended as a secondary site, while sites **7-708.7-LWE (7.11; Winter's Landing)** and **7-706.5-RMT (7.12; Dakota Island)** were recommended as emergency sites. Descriptions of the existing conditions and site development impacts for the selected GREAT I sites are provided in Volume 8 of the Technical Appendices of the GREAT I study. The impacts of using the sites selected by GREAT I are summarized below.

B-11.2.2 CMMP

In subsequent planning for implementation of the GREAT I plan, all the GREAT I selected sites listed above, two sites evaluated by GREAT I but not recommended (7-712.0-LWP (7.04) and 7-705.0-LMP (7.13)), and two new sites (7-707.3-RMP (7.25A; Dakota Boat Ramp) and 7-703.4-LMP (Dresbach Island)) were evaluated as potential dredged material placement sites.

The CMMP for pool 7 would use the following sites for permanent placement of materials: **7-714.1-LWP (7.06; Trempealeau), 7-713.1-RMP (7.05; Hot Fish Shop)** and **7-707.3-RMP (7.25A; Dakota Boat Ramp)**. Under the CMMP, site **7-708.7-LWE (7.11; Winter's Landing)** would be used as an emergency site for the Winter's Landing cut. Rather than an emergency site, as proposed under the GREAT I plan, site **7-706.5-RMT (7.12; Dakota Island)** would serve as a transfer/rehandling site. Descriptions of the existing conditions and proposed developments for dredged material placement at these sites are provided in TAB 17 of the CMMP. A summarization of the impacts of using these sites is provided below. For additional detail on the impacts of the GREAT I plan and CMMP, the reader should refer to Section 5.0 of this EIS, the GREAT I EIS, the Section 404(b)(1) Evaluation (see Appendix D) and the Biological Assessment (see Appendix C).

B-11.2.3 Impacts of Site Use

7-714.1-LWP (7.06; Trempealeau) - GREAT I recommended primary site, CMMP selected site

Site 7-714.1-LWP (7.06; Trempealeau) is federally owned site adjacent to Lock and Dam 6. A commercial fish storage pond and wetland habitat comprise the majority of the site. A portion of the site has been used for dredged material placement.

Acreage affected under GREAT I = 7 acres of type 1-2 wetlands and 14 acres of type 3-4-5 wetlands; 21 acres total.
Acreage affected under CMMP = 5 acres of type 3-4-5 wetlands.

a. Substantial adverse impacts on fish and wildlife habitats under GREAT I, minor adverse impacts under CMMP.
b. Substantial adverse impacts on water quality if site used with hydraulic dredging and in water rehandling (effluent return water discharged to river with elevated turbidity and suspended solids concentrations; direct placement of material in water), no adverse impacts on water quality if site used with mechanical dredging.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. No adverse floodplain impacts (site is out of the floodplain and floodway).
e. No adverse impacts on recreation.
f. No adverse impacts on cultural resources. Site approved by WISHPO on 28 May 1982.

g. Minor adverse impacts on socioeconomic resources (safety concerns associated with proximity of site to a public boat launching facility and private marina; minor intrusion on the visual aesthetic environment of the river).
h. 93 percent (1,216,000 c.y.) beneficial use removal projected under GREAT I; 98 percent (800,000 c.y.) beneficial use removal projected under the CMMP.
i. Minor adverse impacts on aesthetics (continued use of site would not contribute to already significant visual intrusion of stockpile).

7-713.1-RMP (7.05; Hot Fish Shop) - GREAT I recommended primary site, CMMP selected site

Site 7-713.1-RMP (7.05; Hot Fish Shop) consists of a series of privately owned commercial fish storage ponds, bottomland hardwood forest and disturbed dredged material placement areas. At this site, located approximately 1 mile below Lock and Dam 6, the Minnesota Department of Natural Resources proposes to develop a public access.

Acreage affected under GREAT I = 4 acres of type 1-2 wetlands and 8 acres of type 3-4-5 wetlands; 12 acres total.
Acreage affected under CMMP = 3 acres of old dredged material.

a. Minor adverse impacts on fish and wildlife habitats under both plans.
b. No adverse impacts on water quality (mechanical placement).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. Minor benefits to recreation (material would be used in development of a boat launching facility).
f. Low potential for adverse impacts on cultural resources. Site surveyed in 1988 with negative results and approved by MNSHPO on 16 June 1982.
g. Minor adverse impacts on socioeconomic resources (disruption of the current site use as fish rearing ponds; intrusion on the visual aesthetic environment).
h. 16 percent (101,500 c.y.) beneficial use removal projected under GREAT I; 100 percent (400,000 c.y.) beneficial use removal projected under the CMMP.
i. Minor adverse impacts on aesthetics.

7-712.0-LWP (7.04) - considered, but not selected for CMMP

Site 7-712.0-LWP (7.04) is located within the UMRWFR adjacent to Richmond Island. Formerly used for dredged material placement, the riverward side of the site receives heavy recreational use. The site is primarily floodplain forest habitat; however, a 2-acre wetland exists in the center of the site. The back of the site borders on floodplain forest and a backwater slough.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, approximately 6 acres of type 1-2 wetlands, 2 acres of type 3-4-5 wetlands and 8 acres of old dredged material (16 acres total) were considered for dredged material placement under the dredged material placement reconnaissance report for pool 7.

a. Substantial adverse impacts on fish and wildlife habitats.
b. Substantial adverse impacts on water quality if site used with hydraulic dredging and in water rehandling (effluent return water discharged to river with elevated turbidity and suspended solids concentrations; direct placement of material in water), no adverse impacts on water quality if site used with mechanical dredging.
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. Minor benefits to recreation from maintenance of sandy beach areas; however, short-term disruption of recreational use of area during placement actions.
f. Low potential for adverse impacts on cultural resources. Undisturbed areas must be surveyed and coordinated with WISHPO.
g. Minor adverse impacts on socioeconomic resources (placement site would create a visual intrusion on aesthetic environment; disruption of recreational use of area during placement actions).
h. Material available for beneficial use removal; no projection of quantity provided.
i. Minor adverse impacts on aesthetics.

7-708.7-LWE (7.11; Winter's Landing) - GREAT I recommended emergency site, CMMP selected emergency site

Site 7-708.7-LWE (7.11; Winter's Landing) is a federally owned site within the UMRWFR . The site has also been used for dredged material placement in the past and is divided into two parts lying on both sides of the channel at RM 708.7. The left bank portion is floodplain forest with some old dredged material habitat present. The right bank portion is a beach nourishment site along 1,000 feet of shoreline.

Acreage affected under GREAT I = 1 acre of old dredged material.
Acreage affected under CMMP = 1 acre of old dredged material and 1 acre of type 1-2 wetlands; 2 acres total.

a. No adverse impacts on fish and wildlife habitats under GREAT I, minor adverse impacts on fish and wildlife habitats under the CMMP.
b. Minor, short-term adverse impacts on water quality (hydraulic placement; effluent return with elevated turbidity and suspended solids predicted in the range of 50 to 250 ppm).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. Minor benefits to recreation from creation of an open sandy area adjacent to the river.

f. Moderate potential for adverse impacts on cultural resources (artifacts found north of placement site in 1988 survey). Any expansion of this site must be preceded by surveys and coordination. Continued use of the existing placement area approved by the WISHPO on 28 May 1982.
g. No appreciable adverse impacts on socioeconomic resources.
h. No beneficial use removal projected under GREAT I or CMMP (emergency placement site).
i. No adverse impacts on aesthetics (site is already disturbed).

7-707.3-RMP (7.25A; Dakota Boat Ramp) - CMMP selected site

Site 7-707.3-RMP (7.25A; Dakota Boat Ramp) is located on the north side of the village of Dakota, Minnesota. It is heavily wooded with bottomland forest and has potential for recreational development. The site is bounded on two sides by roads, on a third by developed property and on the fourth by a small trout stream (Dakota Creek).

Acreage affected under CMMP = 5 acres of type 1-2 wetlands.

a. Minor adverse impacts on fish and wildlife habitats.
b. Substantial adverse impacts on surface water quality if site used with hydraulic dredging and in water rehandling (discharge of effluent return to designated trout stream; violation of turbidity and temperature standards likely); potential adverse impacts on groundwater.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse floodplain impacts (in the floodplain and floodway of Dakota Creek).
e. Minor benefits to recreation associated with use of material for development of a boat launching facility.
f. Moderate potential for adverse impacts on cultural resources. Site must be surveyed and coordinated with MNSHPO.
g. Minor benefits to socioeconomic resources (development of the site for recreational uses; beneficial use stockpile).
h. 100 percent (156,100 c.y.) beneficial use of material (passive use) projected on-site.
i. Minor adverse impacts on aesthetics.

7-706.5-RMT (7.12; Dakota Island) - GREAT I recommended emergency site, CMMP selected transfer site

Site 7-706.5-RMT (7.12; Dakota Island) is a federally owned site within UMRWFR on Dakota Island. This island site has been used extensively for dredged material placement in the past and is almost entirely old dredged material habitat.

Acreage affected under GREAT I = 6.4 acres of old dredged material.
Acreage affected under CMMP = 8 acres of old dredged material.

a. Minor adverse impacts on fish and wildlife habitats.
b. Minor, short-term adverse impacts on water quality (effluent return generated by hydraulic placement discharged to the river with elevated turbidity and suspended solids of 50 to 250 ppm).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. No appreciable effects on recreation.
f. No adverse impacts on cultural resources. Site surveyed in 1975 and again in 1988 with negative results, and, therefore, approved by MNSHPO on 8 July 1982.
g. No appreciable effects on socioeconomic resources.
h. No beneficial use removal of material projected (emergency site under GREAT I; transfer site under CMMP).
i. No adverse impacts on aesthetics.

7-705.0-LMP (7.13) - considered, but not selected for CMMP

Site 7-705.0-LMP (7.13) is composed of revegetated dredged material and floodplain forest. Located on the upstream end of Dresbach Island, the downstream sides of the site are deepwater marsh and open water habitats.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, up to 39 acres of revegetating old dredged material and floodplain forest were considered for dredged material placement under the dredged material placement reconnaissance report for pool 7.

a. Minor adverse impacts on fish and wildlife habitats.
b. Minor, short-term adverse impacts on water quality (effluent return generated by hydraulic placement discharged to the river; elevated turbidity and suspended solids of 50 to 150 ppm).
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts (site is within floodplain and floodway).
e. Minor benefits to recreation from beach nourishment.
f. No adverse impacts on cultural resources. Site surveyed in 1975 with negative results and approved by MNSHPO on 6 October 1982.
g. No appreciable adverse impacts on socioeconomics (minor degradation of aesthetics).
h. No beneficial use removal of material projected (island site).
i. No adverse impacts on aesthetics.

7-705.2-RMP (7.01) - GREAT I recommended secondary site

Site 7-705.2-RMP (7.01) is a disturbed stockpile site in Dresbach, Minnesota. The site has been used in the past for placement of dredged materials.

Acreage affected under GREAT I = 1.2 acres of old dredged material.

a. No adverse impacts on fish and wildlife habitats.
b. No adverse impacts on water quality (mechanical placement).
c. No assessment of impacts on threatened and endangered species completed.
d. No adverse floodplain impacts (site is out of the floodplain and floodway).
e. No adverse impacts on recreation.
f. MNSHPO approved.
g. Minor adverse impacts on socioeconomic resources (safety, noise and general disturbance of nearby residential areas).
h. 100 percent (100,000 c.y.) beneficial use removal of material projected.
i. No adverse impacts on aesthetics.

7-703.4-LMP (Dresbach Island) - considered, but not selected for CMMP

Site 7-703.4-LMP (Dresbach Island) is located on the downstream end of Dresbach Island approximately 1 mile upstream from Lock and Dam 7. The site is level and grass and shrub vegetation has established on existing dredged material deposited in the 1960's.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, up to 11 acres of old dredged material and type 1-2 wetlands were considered for dredged material placement under the dredged material placement reconnaissance report for pool 7.

a. Negligible adverse impacts on fish and wildlife habitats.
b. Minor, short-term adverse impacts on water quality (effluent return generated by hydraulic placement discharged to the river; elevated turbidity and suspended solids of 50 to 150 ppm).
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts (site is within floodplain and floodway).
e. Minor benefits to recreation from beach nourishment.
f. Approved by MNSHPO on January 11, 1983.
g. No appreciable impacts on socioeconomics (minor degradation of aesthetics).
h. No beneficial use removal of material projected (island site).
i. Minor adverse impacts on aesthetics.

7-702.5-RMP (7.20) - GREAT I recommended primary site

Site 7-702.5-RMP (7.20) is a small area located between the Milwaukee Road Railroad embankment and the bay behind the upper guidewall at Lock and Dam 7. There is a steep slope between this bay and the placement site. The site, owned by the Federal Government as part of Lock and Dam 7, is maintained in grass with some tree plantings.

Acreage affected under GREAT I = 1.7 acres of disturbed terrestrial habitat.

a. No adverse impacts on fish and wildlife habitats.
b. No adverse impacts on water quality (mechanical placement).
c. No assessment of impacts on threatened and endangered species completed.
d. No floodplain impacts (site is within the floodplain but out of the floodway).
e. No impacts on recreation.
f. Low potential for adverse impacts on cultural resources. Site approved by MNSHPO on 6 October 1982.
g. No appreciable impacts on socioeconomic resources.
h. 100 percent (110,000 c.y.) beneficial use removal of material projected.
i. No adverse impacts on aesthetics.

B-11.2.4 Comparison of Plans

Neither plan would be expected to have any significant adverse water quality impacts (Tables B-34 and B-35) because the main channel sediments in pool 7 are relatively uncontaminated and most impact events would be 2 to 3 days in duration. However, from a water quality perspective, mechanical placement would be preferable over hydraulic placement and/or in-water rehandling of dredged material. Under the GREAT I plan, approximately 1,993,500 cubic yards (95.5 percent) would be mechanically placed and 93,500 cubic yards (4.5 percent) hydraulically placed. Under the CMMP, approximately 1,837,400 cubic yards (88 percent) would be mechanically placed and 249,600 cubic yards (12 percent) hydraulically placed. Some of the material, approximately 156,100 cubic yards, would be in-water rehandled under the CMMP.

Both plans would have minor adverse effects on fish and wildlife habitats (Tables B-34 and B-35). However, the GREAT I plan would convert approximately 33 acres of wetlands to old dredged material, while the CMMP would convert only 11 acres of wetlands to old dredged material. Overall, the GREAT I plan would affect 43.8 acres of upland and wetland, while the CMMP would affect 23 acres.

Although the SHPO approved the use of Sites 7-714.1-LWP (7.06; Trempealeau) and 7-713.1-RMP (7.05; Hot Fish Shop), the fish ponds at these sites were not evaluated. Given the significance of the fishponds at Guttenberg, Iowa, these ponds should be evaluated. The GREAT alternative calls for using many more acres for each site, and if the ponds are significant, this could be an important difference. Given the potential for cultural resources associated with early lumbering, further survey work has been recommended for Site 7-707.3-RMP (7.25A; Dakota Boat Ramp), a CMMP site. The outcomes of the additional reviews called for above will determine which alternative is better from a cultural resources perspective.

SITE	GREAT	CMMP	SECTION 106 STATUS
7-714.1-LWP (7.06; Trempealeau)	X	X	Need to examine fish ponds
7-713.1-RMP (7.05; Hot Fish Shop)	X	X	Need to examine fish ponds
7-708.7-LWE (7.11; Winter's Lnd.)	X	X	Approved
7-707.3-RMP (7.25A; Dakota Boat Ramp)		X	Further testing required
7-706.5-RMT (7.12; Dakota Island)	X	X	Approved
7-705.2-RMP (7.01)	X		Approved
7-702.5-RMP (7.20; L/D 7 Site)	X		Approved

GREAT 6 disposal sites

4 approved
0 require surveys
2 require further coordination (fish ponds)

CMMP 5 disposal sites

2 approved
1 requires further survey work
2 require further coordination (fish ponds)

Table B-34. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

POOL 7 - GREAT

	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values					X		
3. Recreational Opportunities			X				
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use				X			
10. Controversy				X			
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services			X				
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply			X				
8. Commercial Navigation			X				
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands					X		
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				U*			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

Table B-35. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

POOL 7 - CMMP

PARAMETER	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values					X		
3. Recreational Opportunities			X				
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use				X			
10. Controversy				X			
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services			X				
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply			X				
8. Commercial Navigation			X				
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands					X		
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				X	U*		
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

*U = undefined or undetermined for the current stage of planning.

B-12.0 POOL 8

B-12.1 SITE-SPECIFIC IMPACTS OF DREDGING

B-12.1.1 GREAT I Channel Maintenance Plan

Long-term placement site planning was completed for 10 dredge cuts in pool 8 (Table B-36). An estimated volume of 3,679,000 cubic yards of material would be dredged from pool 8 during the course of the 40-year planning horizon under GREAT I.

B-12.1.2 CMMP

Based on historical dredging patterns and current criteria for implementing maintenance dredging, the Warner's Landing, Crosby Slough and Root River cuts were placed on the inactive list (Table B-36). An estimated volume of 3,478,500 cubic yards of material would be dredged from pool 8 during the course of the 40-year planning horizon.

Table B-36. Dredge cuts, Pool 8.

Pool-Cut #	Cut Name	Location (RM)	GREAT I Status	CMMP Status
8-10	La Crosse Railroad Bridge	699.8 to 700.4	Active	Active
8-9	Sand Slough	694.3 to 695.0	Active	Active
8-8	Root River	692.2 to 693.3	Active	Inactive
8-7	Picayune Island	691.4 to 692.4	Active	Active
8-6	Above Brownsville	689.9 to 690.8	Active	Active
8-5	Brownsville	688.7 to 689.4	Active	Active
8-4	Head of Raft Channel	687.5 to 688.7	Active	Active
8-3	Deadman's Slough	686.5 to 687.5	Active	Active
8-2	Crosby Slough	684.7 to 681	Active	Inactive
8-1	Warner's Landing	683.5 to 683.8	Active	Inactive

B-12.1.3 Impacts of Dredging

The impacts of dredging in pool 8 are summarized below.

Acreage affected under GREAT I = 406.1 acres of main channel habitat.
Acreage affected under CMMP = 333.3 acres of main channel habitat.

a. Substantial disturbance to main channel habitats, benthic invertebrates and fish
b. Minor impacts on water quality (sediments are uncontaminated, medium sands).
c. Minor to substantial adverse impacts on freshwater mussels (mussel resources are healthy, but generally not located within main channel dredge cuts).

d. No determination of the effects of dredging cuts 8-9, 8-7 and 8-3 on Federal threatened or endangered species (mussel surveys and coordination required; see Appendix C). No adverse impacts on Federal threatened and endangered species from dredging other active cuts.
e. Minor, short-term adverse impacts on recreation (temporary displacement of recreational craft).
f. No adverse impacts on cultural resources.
g. No appreciable adverse impacts on socioeconomic resources (potential short-term delays to commercial navigation).

B-12.1.4 Comparison of Plans

No significant adverse water quality impacts are anticipated as a result of implementation of either the GREAT I plan or the CMMP (Table B-37 and B-38). Main channel sediments in pool 8 are relatively uncontaminated, and most impact events would be 2 to 3 days in duration.

Dredging under both plans would have substantial adverse impacts on fish and wildlife habitats; however, the GREAT I plan would disturb more acres than the CMMP. Dredging under the CMMP would likely not affect Federal threatened or endangered species, however, mussel surveys in three cuts and coordination of survey results with the USFWS are necessary to confirm this determination. Dredging under the GREAT I plan has not been assessed for affects on Federal threatened or endangered species.

B-12.2 SITE-SPECIFIC IMPACTS OF DREDGED MATERIAL PLACEMENT

B-12.2.1 GREAT I Channel Maintenance Plan

The GREAT I study evaluated 10 sites as potential dredged material placement sites in pool 8. The evaluation of impacts of use of all alternative sites considered by GREAT I, as well as justification for recommending placement sites for pool 8, is provided on pages 137-140 of the GREAT I EIS (Volume 9 of the GREAT I Technical Appendices). Those evaluations are incorporated by reference in this document. The GREAT I plan for management of materials dredged from pool 8 recommended four primary sites: **8-700.0-RMP (8.28), 8-695.7-LWP (8.06, Isle La Plume), 8-688.7-RMP (8.30; Brownsville Containment)** and **8-684.7-LWP (8.01/8.22; Stoddard)**. One emergency site, **8-690.4-LWT (8.17; Above Brownsville),** was also recommended by GREAT I. Descriptions of the existing conditions and site development impacts for the selected GREAT I sites are provided in Volume 8 of the Technical Appendices of the GREAT I study. The impacts of using the sites selected by GREAT I are summarized below.

B-12.2.2 CMMP

In subsequent planning for implementation of the GREAT I plan, all the GREAT I selected sites listed above, two sites evaluated by GREAT I but not recommended (8-694.7-LWP (8.15) and 8-

686.6-LWP (8.20)), and one new site (8-692.6-RMP) were evaluated as potential dredged material placement sites.

The CMMP for pool 8 would use the following sites for permanent placement of materials: **8-695.7-LWP (8.06; Isle La Plume)** and **8-688.7-RMP (8.30; Brownsville Containment)**. Rather than an emergency site, as proposed under the GREAT I plan, site **8-690.4-LWT (8.17; Above Brownsville)** would serve as a transfer/rehandling site. Descriptions of the existing conditions and proposed developments for dredged material placement at these sites is provided in TAB 18 of the CMMP. A summarization of the impacts of using these sites is provided below. For additional detail on the impacts of the GREAT I plan and CMMP, the reader should refer to Section 5.0 of this EIS, the GREAT I EIS, the Section 404(b)(1) Evaluation (see Appendix D) and the Biological Assessment (see Appendix C).

B-12.2.3 Impacts of Site Use

8-700.0-RMP (8.28) - GREAT I recommended primary site

Site 8-700.0-RMP (8.28) is a developed residential site consisting of several small, privately owned parcels. A total of 4 acres of previously disturbed wetlands would be affected by use of this site. Residents have requested material for fill around building foundations and for beach nourishment.

Acreage affected under GREAT I = 4 acres to type 1-2 wetlands.

a. Minor adverse impact on fish and wildlife habitats.
b. Minor adverse impacts on water quality (elevated turbidity and suspended solids associated with effluent return water generated during hydraulic placement); no adverse impacts on water quality if mechanical placement is employed.
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse impacts on floodplain functions (site is within the floodplain and floodway).
e. Beneficial impacts on recreation (beach nourishment and enhancement).
f. The MNSHPO approved the use of this site on February 11, 1983.
g. Minor beneficial impacts on socioeconomic resources (material used by cottage owners as fill around building foundations and beach nourishment).
h. No beneficial use removal of material projected (material used on-site considered passive beneficial).
i. No adverse impacts on aesthetics.

8-695.7-LWP (8.06; Isle La Plume) - GREAT I recommended primary site, CMMP selected site

Site 8-695.7-LWP (8.06; Isle La Plume) is located on Isle La Plume in La Crosse, Wisconsin. The site is owned by the city of La Crosse and is located near the La Crosse boat harbor,

wastewater treatment plant and transit commission building. The entire site has been disturbed by development of one type or another.

Acreage affected under GREAT I = 44 acres of old dredged material.
Acreage affected under CMMP = 9 acres of disturbed terrestrial habitat.

a. No appreciable impacts on fish and wildlife habitats
b. No adverse impacts on water quality (site use limited to mechanical methods of placement).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. No impacts on floodplain functions (site is out of both the floodplain and floodway).
e. No impacts on recreation.
f. Low potential for impacts on cultural resources. Site approved by WISHPO on 11 February 1983.
g. No appreciable impacts on socioeconomic resources.
h. 100 percent (1,857,500 c.y.) beneficial use removal of materials projected under GREAT I; 100 percent (1,650,500 c.y.) beneficial use removal of materials projected under the CMMP.
i. No adverse impacts on aesthetics (site is already heavily disturbed).

8-694.7-LW (8.15) - considered, but not selected for CMMP

Site 8-694.7-LW (8.15) is located on Green Island near the south side of La Crosse. Formerly used for dredged material placement, this site is a bottomland hardwood forest bounded by a backwater marsh.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, approximately 12 acres of floodplain forest (type 1-2 wetlands) were considered for dredged material placement under the dredged material placement reconnaissance report for upper pool 8.

a. Minor adverse impacts on fish and wildlife habitats.
b. Minor adverse impacts on water quality (elevated turbidity and suspended solids concentrations [possibly up to 250 to 300 ppm] associated with effluent return water generated during hydraulic placement).
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse impacts on floodplain functions (site is within both the floodplain and floodway).
e. Minor benefits to recreation from creation of sandy beach areas.
f. Low potential for impacts on cultural resources. Site surveyed in 1975 with negative results and approved by WISHPO on 11 February 1983, under the condition that placement activities not extend beyond previously disturbed areas.
g. Minor adverse impacts on socioeconomic resources (degradation of the visual and aesthetic environments).

h. No beneficial use removal of material projected .
i. Minor adverse impacts on aesthetics.

8-692.6-RMP - considered, but not selected for CMMP

Site 8-692.6-RMP is located downstream of the mouth of the Root River. The site is owned by the Federal Government and is characterized by typical bottomland forest habitat.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, approximately 10 acres of floodplain forest (type 1-2 wetlands) were considered for dredged material placement under the dredged material placement reconnaissance report for upper pool 8.

a. Minor adverse impacts on fish and wildlife habitats.
b. Minor adverse impacts on water quality (elevated turbidity and suspended solids concentrations associated with effluent return water generated during hydraulic placement).
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse impacts on floodplain functions (site is within the floodplain and floodway).
e. Minor benefits to recreation from creation of sandy beach area.
f. High potential for adverse impacts on cultural resources. Site surveyed in 1989 with positive results. Site must be resurveyed and coordinated with MNSHPO.
g. No appreciable impacts on socioeconomic resources (minor degradation of visual/aesthetic environment).
h. No beneficial use removal of materials projected.
i. Minor adverse impacts on aesthetics.

8-690.4-LWT (8.17; Above Brownsville) - GREAT I recommended emergency site, CMMP selected transfer site

Site 8-690.4-LWT (8.17; Above Brownsville) is a federally owned site within the UMRWFR on Crosby Island. The site includes a diked containment area.

Acreage affected under GREAT I = 8.5 acres of old dredged material.
Acreage affected under CMMP = 14 acres of old dredged material.

a. No appreciable impacts on fish and wildlife habitats under either plan.
b. Minor, short-term adverse impacts on water quality (elevated turbidity and suspended solids concentrations [50 to 150 ppm] associated with effluent return water generated during hydraulic placement).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse impacts on floodplain functions (site is within the floodplain and floodway).

e. No appreciable impacts on recreation; however, periodic excavation would create temporary harbor-like area for recreational use.
f. No adverse impacts on cultural resources. Site surveyed in 1975 with negative results and approved by WISHPO on 11 February 1983, as long as site use is limited to previously disturbed areas.
g. Minor adverse impacts on socioeconomic resources (site is a visual intrusion on the aesthetic environment).
h. No beneficial use removal of material projected (site recommended as an emergency site under GREAT I and as a transfer/rehandling site under the CMMP).
i. Minor adverse impacts on aesthetics (continued site use would not affect already significant visual intrusion of large sand placement site).

8-688.7-RMP (8.30; Brownsville Containment) - GREAT I recommended primary site, CMMP selected site

Site 8-688.7-RMP (8.30; Brownsville Containment) is a federally owned site lying within the UMRWFR at Brownsville, Minnesota. It has been used extensively for dredged material placement. The site is a mixture of old dredged material, floodplain forest and various wetland types.

Acreage affected under GREAT I = 22 acres of type 1-2 wetlands, 11 acres of type 3-4-5 wetlands and 22 acres of old dredged material; 55 acres total.
Acreage affected under CMMP = 11 acres of type 1-2 wetlands, 6 acres of type 3-4-5 wetlands, 17 acres of old dredged material and 2 acres of agricultural field; 36 acres total.

a. Substantial adverse impacts on fish and wildlife habitats under both plans.
b. No adverse impacts on surface water quality (although hydraulic placement most likely employed; the large size and wetland nature of the site would effectively filter effluent return water removing turbidity and suspended solids); potential adverse impacts on groundwater.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Substantial adverse impacts on floodplain functions (site is within the floodplain and floodway).
e. Minor beneficial impacts on recreation (maintenance of sandy areas adjacent to main channel).
f. Low potential for adverse impacts on cultural resources. Site approved by MNSHPO on 11 February 1983.
g. Significant adverse impacts on socioeconomics (severe degradation of the visual/aesthetic environment; site would block the view of the river from Brownsville, MN).
h. 34 percent (645,000 c.y.) beneficial use removal of materials projected under both GREAT I and the CMMP.
i. Significant adverse aesthetic impacts.

8-686.6-LWP (8.20) - considered, but not selected for CMMP

Site 8-686.6-LWP (8.20) is a partially revegetated placement island on the left side of the channel at UMR mile 686.6. The site is a small island (Turtle Island) located in Deadman's Slough about 2 miles downstream from Brownsville, Minnesota. The site is moderately vegetated and basically flat with the exception of some small placement piles. A mixture of bottomland hardwood and willow shrub habitats along with some relatively sandy areas characterize the site. The forest habitat on the island is predominantly mature cottonwoods, silver maple, and green ash with a shrub layer of grape, black raspberry and Virginia creeper. The ground layer is primarily vegetated with nettle and nightshade.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, approximately 4 acres of floodplain forest (type 1-2 wetlands) and 4 acres of old dredged material were considered for dredged material placement under the dredged material placement reconnaissance report for lower pool 8.

a. Substantial adverse impacts on fish and wildlife habitats (most of the wooded island would be converted to dredged sand).
b. Minor, short-term adverse impacts on water quality (elevated turbidity and suspended solids concentrations [50 to 250 ppm] associated with effluent return water generated during hydraulic placement).
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse impacts on floodplain functions (island site within the floodplain and floodway).
e. Minor benefits to recreation (maintenance/creation of open sandy area adjacent to main channel).
f. Low potential for adverse impacts on cultural resources; however, site must be surveyed and coordinated with WISHPO.
g. No appreciable adverse impacts on socioeconomics (minor degradation of visual/aesthetics).
h. No beneficial use removal of material projected (island site).
i. Minor adverse impacts on aesthetics.

8-684.7-LWP (8.01/8.22; Stoddard) - GREAT I selected primary site

Site 8-684.7-LWP (8.01/8.22) is located in an agricultural field/bottomland hardwood area.

Acreage affected under GREAT I = 4 acres of agricultural field.

a. Minor adverse impacts on fish and wildlife habitats.
b. Minor, temporary adverse impacts on water quality.
c. No assessment of impacts on threatened and endangered species completed.
d. No impacts on floodplain functions (site is out of the floodplain and floodway).

e. No impacts on recreation.

f. High potential for adverse impacts on cultural resources as known archaeological site exists in northern end of placement area. Site must be surveyed and coordinated with WISHPO.

g. Minor adverse impacts on socioeconomics (noise and general disturbance of adjacent residential development; loss of agricultural production).

h. 100 percent (97,000 c.y.) beneficial use removal of material projected.

i. Minor adverse impacts on aesthetics.

B-12.2.4 Comparison of Plans

No significant adverse water quality impacts are anticipated as a result of implementation of either the GREAT I plan or the CMMP (Tables B-37 and B-38). Main channel sediments in pool 8 are relatively uncontaminated, and most impact events would be 2 to 3 days in duration. Additionally, approximately 45 percent of materials removed from pool 8 would be mechanically dredged. Those materials hydraulically dredged would be placed in existing containment sites with adequate site capacity to produce a relatively clean effluent.

Because of the wetland habitats disturbed at Site 8-688.7-RMP (8.30; Brownsville), the GREAT I plan for pool 8 would have minor impacts on fish and wildlife resources. Under GREAT I, approximately 26 acres of floodplain forest, 11 acres of shallow emergent marsh, 74.5 acres of old dredged material and 4 acres of agricultural field would be converted to old dredged material habitat. Comparable figures for the CMMP include 11 acres of floodplain forest, 6 acres of shallow emergent marsh, 31 acres of old dredged material, 2 acres of agricultural field and 9 acres of disturbed terrestrial habitat.

All three sites have been approved for use under the CMMP. All but one of the GREAT sites have been approved. Site 8-684.7-LWP (8.22; Stoddard) would have to be surveyed. As cultural resources have been found at this disposal site, the CMMP would have less impact on cultural resources.

SITE	GREAT	CMMP	SECTION 106 STATUS
8-700.0-RMP (8.28)	X		Approved
8-695.7-LWP (8.06; Isle La Plume)	X	X	Approved
8-690.4-LWT (8.17; Ab. Brownsville)	X	X	Approved
8-688.7-RMP (8.30; Brownsville)	X	X	Approved
8-684.7-LWP (8.22; Stoddard)	X		Surveyed Required

GREAT 5 disposal sites

4 approved
1 require survey and coordination (sites known to exist in immediate area)
0 require coordination

CMMP 3 disposal sites

3 approved
0 require surveys
0 require coordination

Table B-37. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

POOL 8 - GREAT

PARAMETER	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE EFFECT	ADVERSE EFFECT		
	SIGNIFICANT	SUBSTANTIAL	MINOR		MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values					X		
3. Recreational Opportunities			X				
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use					X		
10. Controversy				X			
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services		X					
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply			X				
8. Commercial Navigation			X				
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands					X		
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				U*			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

Table B-38. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

POOL 8 - CMMP

	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values					X		
3. Recreational Opportunities			X				
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use				X			
10. Controversy				X			
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services				X			
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply			X				
8. Commercial Navigation			X				
9. Floodplain Effects					X		
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands					X		
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality				X			
8. Water Supply				X			
9. Groundwater				X			
10. Soils				X			
11. Threatened or Endangered Species				X	U*		
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				X			

* U = undefined or undetermined for the current stage of planning.

B-13.0 POOL 9

B-13.1 SITE-SPECIFIC IMPACTS OF DREDGING

B-13.1.1 GREAT I Channel Maintenance Plan

Placement site planning was completed for 10 historic dredge cuts in pool 9 (Table B-39). An estimated total volume of 2,322,000 cubic yards of material would be dredged from these cuts over the 40-year planning window.

B-13.1.2 CMMP

Based on historical dredging patterns and current criteria for implementing maintenance dredging, the Above Crooked Slough, Above Atchafalaya, Desoto and Below Twin Island cuts were placed on the inactive list (Table B-39). An estimated total volume of 2,107,000 cubic yards of material would be dredged from these cuts over the 40-year planning window.

Table B-39. Dredge cuts, Pool 9.

Pool-Cut #	Cut Name	Location (RM)	GREAT I Status	CMMP Status
9-10	Lower Approach to L/D 8	678.7 to 679.2	Active	Active
9-9	Island 126	677.5 to 678.4	Active	Active
9-8	Twin Island	676.0 to 676.6	Active	Active
9-7	Below Twin Island	675.4 to 675.9	Active	Inactive
9-6	Battle Island	671.0 to 672.0	Active	Active
9-5	Desoto	667.4 to 668.5	Active	Inactive
9-4	Indian Camp Light	665.0 to 665.8	Active	Active
9-3	Lansing Upper Light	663.8 to 664.9	Active	Active
9-2	Above Atchafalaya	660.3 to 660.8	Active	Inactive
9-1	Crooked Slough	653.6 to 654.6	Active	Inactive

B-13.1.3 Impacts of Dredging

The impacts of dredging in pool 9 are summarized below.

Acreage affected under GREAT I = 365.5 acres of main channel habitat.
Acreage affected under CMMP = 252.7 acres of main channel habitat.

a. Substantial adverse impacts on main channel habitats, benthic invertebrates and fish.
b. Negligible impacts on water quality (sediments are uncontaminated, medium sands).
c. Minor to substantial adverse impacts on freshwater mussels (mussel resources are healthy).

d. No determination of the effects of dredging cuts 9-10, 9-8 and 9-6 on Federal threatened or endangered species (mussel surveys and coordination required; see Appendix C). No adverse impacts on Federal threatened or endangered species from dredging other active cuts.
e. Minor, short-term disruption of recreational traffic through dredge cut locations.
f. No cultural resources affected.
g. No appreciable social impacts (potential for short-term delays to commercial navigation).

B-13.1.4 Comparison of Plans

Neither plan would be expected to have any significant adverse water quality impacts (Tables B-40 and B-41), because the main channel sediments in pool 9 are relatively uncontaminated and most impact events would be of short duration (2 to 3 days).

Both plans would affect main channel habitats with resulting adverse effects on benthic invertebrates and fish. The GREAT I plan would affect a much larger acreage than the CMMP. Dredging under the CMMP would probably not affect Federal threatened or endangered species, however, mussel surveys in three cuts and coordination of survey results with the USFWS are necessary to confirm this determination.

B-13.2 SITE-SPECIFIC IMPACTS OF DREDGED MATERIAL PLACEMENT

B-13.2.1 GREAT I Channel Maintenance Plan

The GREAT I study evaluated a number of sites for placement of materials dredged from pool 9. The evaluation of impacts of use of all alternative sites considered by GREAT I, as well as justification for recommending placement sites for pool 9, is provided on pages 141-147 of the GREAT I EIS (Volume 9 of the GREAT I Technical Appendices) and incorporated by reference in this document. The GREAT I plan for management of materials dredged from upper pool 9 recommended the following sites as primary sites: **8-695.7-LWP (8.06; Isle La Plume)**, **9-677.7-LWP (9.15; Genoa Power Plant)**, **9-671.8-LWP (9.11; Gantenbein)**, **9-667.5-LWP (9.07; Desoto)**, **9-663.5-RIP (9.26)** and **9-660.0-RIP (9.47)**. Sites **9-671.3-LWP (9.33)** and **9-652.3-LWP (9.41; Lynxville)** were recommended by GREAT I as secondary sites, while Sites **9-663.0-RIP (9.03)** and **9-662.1-RIP (9.28)** were recommended as tertiary sites. Four sites were recommended as emergency sites by GREAT I: **9-678.0-RME (9.21; Island 126)**, **9-676.5-RME (9.20; Twin Island)**, **9-665.8-RIE (9.18; Indian Camp Light)** and **9-664.3-RIT (9.17; Lansing)**. Based on projected dredged material quantities for pool 9, site 9-662.1-RIP (9.28) would likely not be required. Descriptions of the existing conditions and site development impacts for the selected GREAT I sites are provided in Volume 8 of the Technical Appendices of the GREAT I study. The impacts of using the sites selected by GREAT I in pool 9 are summarized below. The impacts of using site 8-695.7-LWP (8.06; Isle La Plume) are summarized in the preceding section of this EIS.

B-13.2.2 CMMP

In subsequent planning for implementation of the GREAT I plan, all the GREAT I recommended sites listed above, two sites considered but not recommended by GREAT I (9-671.3-RIP (9.19) and 9-668.0-RIP (9.36)), and three new sites (9-677.6-LWP, 9-670.5-LWP (9.55; Blackhawk Park) and 9-663.5-LWP (9.50; Lansing Highway Bridge) were evaluated as potential dredged material placement sites. Additionally, based on historical dredging patterns and current criteria for implementing maintenance dredging, the Above Crooked Slough, Above Atchafalaya, Desoto and Below Twin Island cuts were placed on the inactive list.

The CMMP for pool 9 would use four permanent placement sites: **8-695.7-LWP (8.06; Isle La Plume), 9-677.7-LWP (9.15; Genoa Power Plant), 9-670.5-LWP (9.55; Blackhawk Park)** and **9-663.5-LWP (9.50; Lansing Highway Bridge)**. Site **9-664.3-RIT (9.17; Lansing)** was selected as a transfer/rehandling site, while Site **9-665.8-RIE (9.18; Indian Camp Light)** was selected as an emergency placement site. Descriptions of the existing conditions and proposed developments for dredged material placement at these sites are provided in TAB 19 of the CMMP. With the exception of site 8-695.7-LWP (8.06; Isle La Plume) which is discussed in the preceding section of this EIS, the impacts of using the selected CMMP sites for pool 9 are summarized below. For additional detail on the impacts of the GREAT I plan and CMMP, the reader should refer to Section 5.0 of this EIS, the GREAT I EIS, the Section 404(b)(1) Evaluation (see Appendix D) and the Biological Assessment (see Appendix C).

B-13.2.3 Impacts of Site Use

9-678.0-RME (9.21; Island 126) - GREAT I recommended emergency site

Site 9-678.0-RME (9.21; Island 126) is a previously used dredged material placement site. Bottomland forest occupies approximately 80 percent of site 9-678.0-RME (9.21; Island 126). The remaining 20 percent is old dredged material.

Acreage affected under GREAT I = 10 acres of old dredged material.

a. Minor adverse impacts on fish and wildlife habitat.
b. Minor, short-term adverse impacts on water quality (effluent discharge generated during hydraulic placement would contain elevated turbidity and suspended solids concentrations).
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse impacts on floodplain functions (site is within the floodplain and floodway).
e. Minor benefits to recreation from maintenance of sandy area adjacent to main channel.
f. Low potential for impacts on cultural resources. Site approved by MNSHPO on 9 Jan. 1984.
g. No appreciable impacts on socioeconomic resources .
h. No beneficial use removal of material projected (site is an emergency site).
i. Minor degradation of aesthetic environment.

9-677.7-LWP (9.15; Genoa Power Plant) - GREAT I recommended primary site, CMMP selected site

Site 9-677.7-LWP (9.15; Genoa Power Plant) is a privately owned parking lot and boat launching facility located downstream from the Genoa power plant. Approximately 2 acres at this highly disturbed site would be used for development of a dredged material stockpile.

Acreage affected under GREAT I = 1 acre of disturbed terrestrial habitat.
Acreage affected under CMMP = 2 acres of disturbed terrestrial habitat.

a. No appreciable impacts on fish and wildlife habitat under either plan.
b. No impacts on water quality (site use limited to mechanical placement)
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse impacts on floodplain functions (site is within floodplain and floodway).
e. Minor adverse impacts on recreation (site use would disrupt use of parking lot and boat launching facility present at the site).
f. No impacts on cultural resources. Site approved by WISHPO on 7 December 1983.
g. Minor adverse impacts on socioeconomic resources (disruption of use of boat launching facility; safety concerns associated with juxtaposition of site and boat ramp).
h. 100 percent (180,000 c.y.) beneficial use removal of materials projected under GREAT I; 100 percent (392,500 c.y.) beneficial use removal of material projected under the CMMP).
i. No appreciable impacts on aesthetic environment.

9-677.6-LWP - considered, but not selected for CMMP

Site 9-677.6-LWP is located downstream of the Genoa power plant near site 9.15. The site is privately owned and consists of floodplain forest habitat. During spring floods, there is also habitat available for fish spawning.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, approximately 13 acres of floodplain forest (type 1-2 wetlands) were considered for dredged material placement under the dredged material placement reconnaissance report for upper pool 9.

a. Minor adverse impacts on fish and wildlife habitats.
b. Minor to substantial adverse impacts on water quality (in-water rehandling required; effluent generated during hydraulic placement likely to contain elevated turbidity and suspended solids concentrations).
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse impacts on floodplain functions (site is within the floodplain and floodway).
e. No appreciable impacts on recreation.

f. Moderate potential for cultural resource impacts. Site must be surveyed and coordinated with WISHPO.
g. No impacts on socioeconomic resources.
h. No beneficial use removal projected.
i. Minor adverse impacts on aesthetics.

9-676.5-RME (9.20; Twin Island) - GREAT I recommended emergency site

Site 9-676.5-RME (9.20; Twin Island) consists of two separate areas on opposite ends of Twin Island. Habitat types found at these areas include bottomland forest (approximately 25 percent) and old dredged material (approximately 75 percent). In total, the island covers about 30 acres.

Acreage affected under GREAT I = 10 acres of type 1-2 wetlands, 6 acres of type 3-4-5 wetlands and 14 acres of old dredged material; 30 acres total.

a. Minor adverse impacts on fish and wildlife habitats.
b. Minor, short-term adverse impacts on water quality (effluent discharge generated during hydraulic placement would contain elevated turbidity and suspended solids concentrations in the range of 50 to 300 ppm).
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse impacts on floodplain functions (site is within the floodplain and floodway).
e. Minor benefits to recreation from creation of sandy area.
f. Site approved by MNSHPO on 9 January 1984.
g. No appreciable socioeconomic impacts.
h. No beneficial use removal of material projected (site used for emergency placement).
i. Minor degradation of visual/aesthetic environment.

9-671.8-LWP (9.11; Gantenbein) - GREAT I recommended primary site

Site 9-671.8-LWP (9.11; Gantenbein) is a 5-acre site on the left bank of the UMR. The site has been used in the past for dredged material placement. The center of the site is treeless, with weeds and grasses colonizing the old dredged material deposits. A perimeter of bottomland hardwood trees, including cottonwood, black willow and green ash, surrounds the old dredged material.

Acreage affected under GREAT I = 2 acres of type 1-2 wetlands, 2.5 acres of type 3-4-5 wetlands, and 0.5 acre of disturbed terrestrial habitat; 5 acres total.

a. Minor adverse impacts on fish and wildlife habitat.
b. Minor, short-term adverse impacts on water quality (effluent discharge generated during hydraulic placement would contain elevated turbidity and suspended solids concentrations in the range of 50 to 300 ppm).
c. No assessment of impacts on threatened and endangered species completed.

d. Minor adverse impacts on floodplain functions (site is within the floodplain and floodway).
e. Minor benefits to recreation from creation of open sandy area adjacent to the river.
f. Low potential for adverse impacts on cultural resources. Site surveyed in 1975 with negative results. Site must be coordinated with WISHPO.
g. Minor adverse impacts on socioeconomic resources (safety concern associated with private residence located near site).
h. 43 percent (128,000 c.y.) beneficial use removal of materials projected.
i. Minor adverse impacts on visual/aesthetic environment.

9-671.3-LWP (9.33) - GREAT I recommended secondary site

Site 9-671.3-LWP (9.33) is located along the Blackhawk Park access road. It is a privately owned bottomland forest area of about 13 acres. Green ash, silver maple, American elm, black willow, cottonwood and box elder are the common tree species.

Acreage affected under GREAT I = 12 acres of type 1-2 wetlands and 1 acre of type 3-4-5 wetland; 13 acres total.

a. Minor adverse impacts on fish and wildlife habitats
b. Minor to substantial adverse impacts on water quality (in-water rehandling required; effluent generated during hydraulic placement likely to contain elevated turbidity and suspended solids concentrations).
c. No assessment of impacts on threatened and endangered species.
d. Minor adverse impacts on floodplain functions (site is within the floodplain and floodway).
e. Minor benefits to recreation from creation of an open sandy area adjacent to the river.
f. Low potential for cultural resource impacts, but site survey required before use.
g. No appreciable impacts on socioeconomics.
h. 23 percent (128,000 c.y.) beneficial use removal of materials projected.
i. Minor adverse impacts on aesthetics (degradation of visual/scenic qualities of the area).

9-671.3-RIP - considered, but not selected for CMMP

Site 9-671.3-RIP is located on an island along the main channel near Blackhawk Park. The site is owned by the Federal Government and is a historic placement site last used in the late 1960's to early 1970's. The site is vegetating dredged material habitat with approximately 50 percent of the site floodplain forest, 30 percent brush and willow and the remainder open sand.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, approximately 13 acres of old dredged material were considered for dredged material placement under the dredged material placement reconnaissance report for upper pool 9.

a. No appreciable impacts on fish and wildlife habitats

b. Minor, short-term adverse impacts on water quality (effluent discharge generated during hydraulic placement would contain elevated turbidity and suspended solids concentrations in the range of 50 to 300 ppm).
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse impacts on floodplain functions (site is within the floodplain but out of the floodway).
e. Minor benefits to recreation from maintenance of a popular beach area.
f. No adverse impacts on cultural resources. Site surveyed in 1975 with negative results. Site approved by IASHPO on 4 January 1984.
g. No appreciable impacts on socioeconomics.
h. No beneficial use removal of materials projected.
i. Substantial adverse impacts on aesthetics (significant visual intrusion).

9-670.5-LWP (9.55; Blackhawk Park) - CMMP selected site

Site 9-670.5-LWP (9.55; Blackhawk Park) is located in a recreational area. Dredged material placed at this site either would be used for park development or would be stockpiled for beneficial use removal.

Acreage affected under CMMP = 36 acres of type 1-2 wetlands, 2 acres of type 3-4-5 wetlands, 3 acres of open water, 7 acres of old dredged material and 21acres of disturbed terrestrial habitat; 69 acres total.

a. Substantial adverse impacts on fish and wildlife habitats.
b. Minor, short-term adverse impacts on water quality (effluent discharge generated during hydraulic placement would contain elevated turbidity and suspended solids concentrations in the range of 50 to 300 ppm).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Substantial adverse impacts on floodplain functions (site is within the floodplain and floodway).
e. Substantial benefits to recreation (material used for development/rehabilitation of park facilities).
f. Low potential for impacts to cultural resources. Site surveyed in 1982 with negative results; WISHPO approved site on 16 July 1987.
g. Minor benefits to socioeconomic resources (park development would benefit business interests in the vicinity).
h. 53 percent (460,000 c.y.) beneficial use removal of materials projected; materials left on site would be used for passive benefits.
i. Minor, short-term adverse impacts on aesthetics.

9-668.0-RIP (9.36) - considered, but not selected for CMMP

Site 9-668.0-RIP (9.36) is an 8-acre site of bottomland hardwood and backwater marsh habitat.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, approximately 8 acres of floodplain forest (type 1-2 wetlands) were considered for dredged material placement under the dredged material placement reconnaissance report for upper pool 9.

a. Minor adverse impacts on fish and wildlife habitat.
b. Minor, short-term impacts on water quality.
c. No assessment of impacts on threatened and endangered species completed.
d. Minor adverse floodplain impacts (site is within the floodplain and floodway).
e. No impacts on recreation.
f. Low potential for impacts to cultural resources. However, a site survey is required before use, and work must be coordinated with ISHPO.
g. No appreciable impacts on socioeconomics.
h. No beneficial use removal of materials projected.
i. Minor adverse impacts on aesthetics.

9-667.5-LWP (9.07; Desoto) - GREAT I recommended primary site

Site 9-667.5-LWP (9.07; Desoto) is lies landward of Highway 35 in DeSoto, Wisconsin. The site is a combination of disturbed upland, floodplain forest and deep marsh habitat.

Acreage affected under GREAT I = 3 acres of type 1-2 wetlands and 10 acres of type 3-4-5 wetlands; 13 acres total.

a. Substantial adverse impacts on fish and wildlife habitat
b. Minor, short-term adverse impacts on water quality (in-water rehandling of materials required; effluent discharge generated during hydraulic placement would contain elevated turbidity and suspended solids concentrations in the range of 50 to 200 ppm).
c. No assessment of impacts on threatened and endangered species completed.
d. No appreciable impacts on floodplain functions (site is within the floodplain but out of the floodway).
e. Minor beneficial impacts on recreation (materials placed on-site would be used to develop area for recreational purposes).
f. Low potential for impacts on cultural resources. Site approved by WISHPO on 18 January 1984.
g. Both minor benefits and minor adverse impact on socioeconomic resources (park development would benefit economy of local community; however, potential noise and associated disturbance would adversely affect nearby residential area).

h. 36 percent (200,000 c.y.) beneficial use removal of material projected; material left on-site would be used for park development (passive beneficial use).
i. Minor adverse impacts on aesthetic environment (stockpile would be a visual intrusion).

9-665.8-RIE (9.18; Indian Camp Light) - GREAT I recommended emergency site, CMMP selected emergency site

Site 9-665.8-RIE (9.18; Indian Camp Light) is located in a bottomland hardwood forest. A small portion of the site (3 acres) has been used for placement in the past. Behind the site are backwater sloughs and marshes.

Acreage affected under GREAT I = 2.7 acres of type 1-2 wetlands.
Acreage affected under CMMP = 3 acres of old dredged material.

a. Minor adverse impacts on fish and wildlife habitat under both plans.
b. Minor, short-term adverse impacts on water quality (effluent discharge generated during hydraulic placement would contain elevated turbidity and suspended solids concentrations in the range of 50 to 300 ppm).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse impacts on floodplain functions (site is within the floodplain and floodway).
e. Minor benefits to recreation from maintenance of a sandy area adjacent to the river.
f. Approved by ISHPO on 24 January 1983.
g. No appreciable impacts on socioeconomic resources.
h. No beneficial use removal of materials projected (site would be used for emergency placement).
i. Minor negative impacts on aesthetics.

9-664.3-RIT (9.17; Lansing) - GREAT I recommended emergency site, CMMP selected transfer site

Site 9-664.3-RIT (9.17; Lansing) is a bermed containment site on an island on the right bank of the UMR at UMR mile 664.3. The island itself was used for placement in the past and is a combination of old dredged material and bottomland forest. The island is bounded on the back by a deepwater marsh.

Acreage affected under GREAT I = 4 acres of old dredged material.
Acreage affected under CMMP = 9 acres of old dredged material.

a. No adverse impacts on fish and wildlife habitat under either plan.
b. Minor, short-term adverse impacts on water quality (effluent discharge generated during hydraulic placement would contain elevated turbidity and suspended solids concentrations in the range of 50 to 300 ppm).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).

d. Minor adverse impacts on floodplain functions (site is within the floodplain and floodway).
e. No appreciable impacts on recreation; however, periodic excavation would create temporary harbor-like area for recreational use.
f. No adverse impacts on cultural resources. Site approved by ISHPO on January 17, 1983.
g. No appreciable impacts on socioeconomic resources.
h. No beneficial use removal of materials projected (site would be used as either an emergency or transfer site).
i. Minor negative impacts on aesthetics (containment dikes would be a visual intrusion on the scenic qualities of the river).

9-663.5-RIP (9.26) - GREAT I recommended primary site

Site 9-663.5-RIP (9.26) is a site adjacent to a marina in Lansing, Iowa. The site is 100 percent wetland.

Acreage affected under GREAT I = 22 acres of type 3-4-5 wetlands and open water habitats.

a. Substantial adverse impacts on fish and wildlife habitats (loss of high value northern pike spawning habitat; potential impacts on mussel beds).
b. Minor to substantial adverse impacts on water quality (effluent return generated during hydraulic placement with elevated turbidity and suspended solids concentrations).
c. No assessment of impacts on threatened and endangered species.
d. Minor negative impacts on floodplain functions (site is within the floodplain and floodway).
e. Substantial benefits to recreation (material used in the construction of a marina).
f. On January 24, 1983, the ISHPO determined that a survey was not needed.
g. Minor positive impacts on socioeconomic resources (development of a marina would have positive social benefits).
h. No beneficial use removal of material projected (material left on-site would be used passively).
i. Minor negative effects on aesthetics (degradation of natural wetland area).

9-663.5-LWP (9.50; Lansing Highway Bridge) - CMMP selected site

Site 9-663.5-LWP (9.50; Lansing Highway Bridge) is located beneath and south of the Lansing Highway bridge. The site is located in a floodplain forest wetland.

Acreage affected under CMMP = 5 acres of type 1-2 wetlands.

a. Minor adverse impacts on fish and wildlife habitat.
b. Minor, short-term adverse impacts on water quality (effluent discharge generated during hydraulic placement would contain elevated turbidity and suspended solids concentrations in the range of 50 to 300 ppm).

c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse impacts on floodplain functions (site is within the floodplain and floodway).
e. Minor negative effects on recreation (site use could interfere with adjacent boat ramp usage).
f. Approved by WISHPO on November 19, 1993.
g. No appreciable impacts on socioeconomic resources.
h. 72 percent (340,000 c.y.) beneficial use removal of material projected.
i. Substantial negative impacts on aesthetics (visual intrusion of stockpile on natural river viewshed).

9-663.0-RIP (9.03) - GREAT I recommended tertiary site

Site 9-663.0-RIP (9.03) is a baseball field in the city of Lansing, Iowa. The site lies about 200 feet from the UMR. Materials placed at this site would be beneficially used in development of a recreational complex. The site is owned by the city of Lansing and the city has indefinite plans to fill and upgrade the site.

Acreage affected under GREAT I = 4.1 acres of disturbed terrestrial habitat.

a. No appreciable impacts on fish and wildlife habitats.
b. No impacts on water quality (site use limited to mechanical dredging).
c. No assessment of impacts on threatened and endangered species.
d. Minor adverse impacts on floodplain functions (site is within the floodplain and floodway).
e. Minor benefits to recreation (material would be used to elevate a baseball diamond).
f. Need to coordinate site with IASHPO for cultural resources.
g. Minor adverse impacts on socioeconomic resources (disturbance of nearby residential area).
h. No beneficial use removal projected (material used on-site for passive beneficial purposes).
i. No adverse impacts on aesthetics.

9-662.2-RIP (9.28) - GREAT I recommended tertiary site

Site 9-662.2-RIP (9.28) is a wetland site below Lansing, Iowa, on the left bank of Village Creek, a small trout stream. The site is bordered to the north and east by Highways 52 and 42. The site is (was) being considered for development as a boat landing by the Iowa Department of Natural Resources.

Acreage affected under GREAT I = this site would not be needed, is no longer available or is a conditional substitute under GREAT I, however, up to 33 acres of floodplain forest and shallow/deep emergent marsh (type 3-4-5 wetlands) were considered for dredged material placement under the GREAT I plan.

a. Substantial adverse impacts on fish and wildlife habitats.
b. Minor and temporary impacts on water quality.
c. No assessment of impacts on threatened and endangered species.

d. Minor adverse impacts on floodplain functions (site is within the floodplain and floodway of Village Creek).
e. Substantial benefits to recreation (material used for development of a boat ramp and parking lot).
f. Moderate potential for impacts on cultural resources. Site must be surveyed and coordinated with ISHPO.
g. Substantial benefits to socioeconomic resources (development of boat ramp and parking lot would contribute to economic growth of the area).
h. No beneficial use removal of material projected (material used on-site for passive beneficial purposes).
i. Minor adverse impacts on aesthetics.

9-660.0-RIP (9.47) - GREAT I recommended primary site

Site 9-660.0-RIP (9.47) is a 1-acre site at the Lansing Generating Station. The site is highly disturbed and would be used as a beneficial use stockpile. The portion of the site that would be used as a stockpile area is covered with scrub brush vegetation.

Acreage affected under GREAT I = 1 acre of disturbed terrestrial habitat.

a. No impacts on fish and wildlife habitat.
b. No impacts on water quality.
c. No assessment of impacts on threatened and endangered species.
d. Minor adverse impacts on floodplain functions (site is within the floodplain but out of the floodway).
e. No impacts on recreation.
f. Site must be surveyed and coordinated with ISHPO.
g. No appreciable impacts on socioeconomic resources.
h. 88 percent (126,000 c.y.) beneficial use removal of material projected.
i. No appreciable effects on the aesthetic environment.

9-652.3-LWP (9.41; Lynxville) - GREAT I recommended secondary site

Site 9-652.3-LWP (9.41; Lynxville) is an area on the left bank at UMR mile 652.3. This wooded site lies landward of Highway 35 at the mouth of a very small coulee.

Acreage affected under GREAT I = 2 acres of type 1-2 wetlands, 2 acres of type 3-4-5 wetlands and 4.5 acres of upland forest.

a. Minor adverse impacts on fish and wildlife habitats.
b. No impacts on water quality.
c. No assessment of impacts on threatened and endangered species completed.
d. No impacts on floodplain functions (site is within the floodplain but out of the floodway).

e. No impacts on recreation.
f. Further coordination needed with WISHPO; adverse impacts on known cultural resources.
g. No appreciable impacts on socioeconomic resources.
h. 100 percent (52,000 c.y.) beneficial use removal of materials projected.
i. Minor adverse impacts on aesthetics.

B-13.2.4 Comparison of Plans

Neither plan would be expected to have any significant adverse water quality impacts (Tables B-40 and B-41) because the main channel sediments in pool 9 are relatively uncontaminated and most impact events would be of short duration (2 to 3 days). However, when comparing alternatives from a water quality perspective, those plans that maximize mechanical placement would be preferable over those that emphasize hydraulic placement and/or in-water rehandling of dredged material. Approximately 68 percent of material dredged under the CMMP would be handled mechanically. No in-water rehandling of material would be required under the CMMP. Only 39 percent of the material dredged under the GREAT I plan would be handled mechanically. Additionally, in-water rehandling of materials would be required under GREAT I.

The GREAT I plan would convert 31.7 acres of floodplain forest, 21.5 acres of shallow/deep marsh, 22 acres of open water, 4.5 acres of upland forest, 28 acres of old dredged material and 6.6 acres of disturbed terrestrial habitat to old dredged material. The CMMP would convert 41 acres of bottomland forest, 2 acres of shallow marsh, 3 acres of aquatic habitat, 19 acres of old dredged material and 23 acres of disturbed terrestrial habitat to old dredged material. However, 36 acres of the 41 acres of bottomland forest, all the shallow marsh and aquatic acres, 7 acres of the 19 acres of old dredged material and 21 acres of the 23 acres of disturbed terrestrial habitat would be affected at Blackhawk Park.

All the CMMP sites have been approved, although Site 9-670.5-LWP (9.55; Blackhawk Park) has been conditionally approved only. Any proposed work at this site that goes below the level tested in 1982 would require a survey and cultural resources evaluation. Four of the 13 GREAT sites will require further coordination and possibly surveys. Since the CMMP would affect fewer acres and all the sites have been approved., the potential to affect cultural resources is less. However, surveys could reveal that the GREAT sites have no cultural resources as well. At this point, all we can say is that the CMMP will require less cultural resources review and all the sites have been approved.

SITE	GREAT	CMMP	SECTION 106 STATUS
8-695.7-LWP (8.06; Isle La Plume)	X	X	Approved
9-678.0-RME (9.21; Island 126)	X		Approved
9-677.7-LWP (9.15; Genoa Power Plant)	X	X	Approved
9-676.5-RME (9.20; Twin Island)	X		Approved
9-671.8-LWP (9.11; Gantenbein)	X		Approved
9-671.3-LWP (9.33)	X		Survey needed
9-670.5-LWP (9.55; Blackhawk Park)		X	Approved (conditionally)
9-667.5-LWP (9.07; Desoto)	X		Approved
9-665.8-RIE (9.18; Indian Camp Light)	X	X	Approved
9-664.3-RIT (9.17; Lansing)	X	X	Approved
9-663.5-LWP (9.50; Lansing Hwy. Bridge)		X	Approved
9-663.5-RIP (9.26)	X		Approved
9-663.0-RIP (9.03)	X		Coord. required.
9-660.0-RIP (9.47)	X		Survey needed
9-652.3-LWP (9.41; Lynxville)	X		Coord. required. Known sites.

GREAT 13 disposal sites

9 approved
2 require surveys and coordination
2 require further coordination

CMMP 6 disposal sites

6 approved (one conditionally)

Table B-40. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

POOL 9 - GREAT

PARAMETER	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE EFFECT	ADVERSE EFFECT		
	SIGNIFICANT	SUBSTANTIAL	MINOR		MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values				X			
3. Recreational Opportunities				X			
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use				X			
10. Controversy					X		
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services			X				
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply			X				
8. Commercial Navigation			X				
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat				X			
3. Wetlands						X	
4. Aquatic Habitat						X	
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality				X			
8. Water Supply				X			
9. Groundwater				X			
10. Soils				X			
11. Threatened or Endangered Species				U*			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

Table B-41. ENVIRONMENTAL ASSESSMENT MATRIX
Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

POOL 9 - CMMP

	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values				X			
3. Recreational Opportunities			X				
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use				X			
10. Controversy				X			
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services		X					
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply			X				
8. Commercial Navigation			X				
9. Floodplain Effects					X		
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands						X	
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				X	U*		
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				X			

*U = undefined or undetermined for the current stage of planning.

B-14.0 POOL 10

B-14.1 SITE-SPECIFIC IMPACTS OF DREDGING

B-14.1.1 GREAT I Channel Maintenance Plan

Channel maintenance planning was completed for 10 historic dredge cuts in pool 10 (Table B-42). An estimated volume of 1,387,000 cubic yards of material would be dredged from pool 10 during the 40-year planning time period under GREAT I.

B-14.1.2 CMMP

Based on historical dredging patterns and current criteria for implementing channel maintenance dredging, the Upper Approach to L/D 10, Wyalusing Bend Light, McGregor and Lower Approach to L/D 9 cuts were placed on the inactive list (Table B-42). Channel maintenance planning for the East Channel has been completed under a separate document (see Section 3). An estimated volume of 1,570,500 cubic yards of material would be dredged from pool 10 during the 40-year planning time period under the CMMP.

Table B-42. Dredge cuts, Pool 10.

Pool-Cut #	Cut Name	Location (RM)	GREAT I Status	CMMP Status
10-10	Lower Approach to L/D 9	647.8 to 647.9	Active	Inactive
10-9	Hay Point	646.0 to 646.6	Active	Active
10-8	Jackson Island	643.7 to 644.7	Active	Active
10-7	Mississippi Gardens	642.7 to 643.4	Active	Active
10-6	East Channel	633.2 to 635.8	Active	Deferred
10-5	McGregor	633.2 to 637.5	Active	Inactive
10-4	Wyalusing Bend Light	628.9 to 629.3	Active	Inactive
10-3	Wyalusing	627.3 to 628.0	Active	Active
10-2	McMillan Island	618.4 to 619.6	Active	Active
10-1	Upper Approach to L/D 10	615.1 to 616.0	Active	Inactive

B-14.1.3 Impacts of Dredging

The impacts of dredging in pool 10 are summarized below

Acreage affected under GREAT I = 498.2 acres of main channel habitat.
Acreage affected under CMMP = 215.8 acres of main channel habitat.

a. Substantial disturbance to main channel habitats, benthic invertebrates and fish.
b. Negligible impacts on water quality (sediments uncontaminated, fine to medium sands).
c. Potential for substantial adverse impacts on freshwater mussels (mussel resources healthy, but typically not located in dredge cut location due to frequency of disturbance).

d. No determination of the effects of dredging cuts 10-9, 10-8, 10-7 and 10-3 on Federal threatened or endangered species (mussel surveys and coordination required; see Appendix C). No adverse impacts on Federal threatened or endangered species from dredging other active cuts.
e. Minor, short-term disruption of recreational traffic.
f. No impacts on cultural resources.
g. No appreciable adverse impacts on socioeconomic resources (potential short-term delays to commercial navigation).

B-14.1.4 Comparison of Plans

Neither plan would have significant adverse water quality impacts (Tables B-43 and B-44), because the main channel sediments in pool 10 are relatively uncontaminated and most impact events would be of short duration (2 to 3 days).

The GREAT I plan would affect considerably more main channel aquatic habitat than the CMMP; however, the adverse impacts of dredging under both plans would be substantial. Dredging under the CMMP would likely not affect threatened and endangered species (Tables B-43 and B-44), however, mussel surveys in four cuts and coordination of survey results with the USFWS are needed to confirm this determination. Dredging under the GREAT I plan has not been formally assessed for impacts on threatened or endangered species.

B-14.2 SITE-SPECIFIC IMPACTS OF DREDGED MATERIAL PLACEMENT

B-14.2.1 GREAT I Channel Maintenance Plan

The GREAT I study evaluated 19 sites for placement of materials dredged from pool 10. The evaluation of impacts of use of all alternative sites considered by GREAT I, as well as justification for recommending placement sites for pool 10, is provided on pages 148-153 of the GREAT I EIS (Volume 9 of the GREAT I Technical Appendices) and incorporated by reference in this document. The GREAT I study recommended the following sites as primary sites for placement of dredged materials in Pool 10: **10-647.1-LWP (10.17; Varo Property), 10-646.5-LWP (10.16; Gordon's Bay Landing), 10-642.4-LWP (10.40; Mississippi Gardens), 10-634.6-RIP (10.41), 10-628.0-LWP (10.01; Wyalusing Pit), 10-618.8-RIP (10.04; Esmann Island)** and **10-615.5-RIP (10.02).** Site **10-616.3-RIP (10.03)** was recommended as a secondary site and site **10-644.5-RIE (10.22; Jackson Island)** was recommended as an emergency site. Based on current projection of dredged material quantities, site 10-616.3-RIP (10.03) would likely not be used. Descriptions of the existing conditions and site development impacts for the selected GREAT I sites are provided in Volume 8 of the Technical Appendices of the GREAT I study. The impacts of using the sites selected by GREAT I in pool 10 are summarized below.

B-14.2.2 CMMP

In subsequent planning for implementation of the GREAT I plan, all the GREAT I recommended sites listed above, two sites considered but not recommended by GREAT I (10-627.8-LWP (10.24; Wyalusing Beach) and 10-618.7-RIT (10.18; McMillan Island)), and three new sites (10-635.0-LWP (10.43; Prairie Municipal Dock), 10-618.0-RIP (Buck Creek) and 10-617.7-RIP (Esmann Island Agricultural Land)) were evaluated as potential dredged material placement sites. Additionally, an in-water rehandling site, 10-643.5-LWI (Jackson Rehandle) was evaluated.

The CMMP for pool 10 would use five permanent placement sites; **10-647.1-LWP (10.17; Varo Property), 10-642.4-LWP (10.40; Mississippi Gardens), 10-628.0-LWP (10.01; Wyalusing Pit), 10-627.8-LWP (10.24; Wyalusing Beach)** and **10-618.0-RIP (Buck Creek)**. As with the GREAT I plan, site **10-644.5-RIE (10.22; Jackson Island)** would be used as an emergency placement site. Site **10-618.7-RIT (10.18; McMillan Island)** would be used as a rehandling site for materials dredged from the McMillan Island dredge cut. Site **10-643.5-LWI (Jackson Rehandle)** would be used as an in-water rehandling site for transfer of materials to site 10-642.4-LWP (10.40; Mississippi Gardens). In addition to these sites, site **10-635.0-LWP (10.43; Prairie Municipal Dock)** was selected for placement of materials dredged from the East Channel of the UMR at Prairie du Chien, WI. However, maintenance of this cut has been deferred and development and use of this site is not anticipated. Descriptions of the existing conditions and proposed developments at these sites are provided in TAB 20 of the CMMP. The impacts of placement of dredged materials at these sites are summarized below. For additional detail on the impacts of the GREAT I plan and CMMP, the reader should refer to Section 5.0 of this EIS, the GREAT I EIS, the Section 404(b)(1) Evaluation (see Appendix D) and the Biological Assessment (see Appendix C).

B-14.2.3 Impacts of Site Use

10-647.1-LWP (10.17; Varo Property) - GREAT I recommended primary site, CMMP selected site

Site 10-647.1-LWP (10.17; Varo Property) is located above the Gordon's Bay boat landing and owned by the Wisconsin Department of Natural Resources and private individuals. Vegetation at the site consists of mixed age bottomland forest. The site is bounded by the Burlington Northern railroad tracks and a large backwater slough.

Acreage affected under GREAT I = 2 acres of type 1-2 wetlands and 1.5 acres of disturbed terrestrial habitat; 3.5 acres total.
Acreage affected under CMMP = 2 acres of type 1-2 wetlands and 2 acres of disturbed terrestrial habitat; 4 acres total.

a. No appreciable impacts on fish and wildlife habitat under either plan.

b. No adverse impacts on surface water quality (site use limited to mechanical placement); potential adverse impacts on groundwater.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor negative impacts on floodplain functions (site is within the floodplain and floodway).
e. No appreciable impacts on recreation.
f. Moderate potential for negative impacts on cultural resources. Site must be surveyed and coordinated with WISHPO.
g. Minor negative impacts on socioeconomics (safety concerns associated with proximity of residential area adjacent to site).
h. No beneficial use removal of materials projected under GREAT I; 100 percent (272,500 c.y.) beneficial use removal of materials projected under the CMMP.
i. Minor adverse impacts on aesthetics (visual intrusion on scenic qualities of the river).

10-646.5-LWP (10.16; Gordon's Bay Landing) - GREAT I recommended primary site

Site 10-646.5-LWP (10.16; Gordon's Bay Landing) is a 6-acre site located at the upper end of Gordon's Bay adjacent to a public boat ramp. Vegetation on this privately owned site is bottomland forest. The site abuts the Burlington Northern Railroad tracks and is bounded on the north and south by open water and wetlands.

Acreage affected under GREAT I = 6 acres of type 1-2 wetlands.

a. Minor negative impact on fish and wildlife habitat (potential erosion from site could affect adjacent backwater lake and main channel border habitat).
b. Minor to substantial adverse impacts on water quality (effluent discharge generated during hydraulic placement would contain elevated turbidity and suspended solids concentrations).
c. No assessment of impacts on threatened and endangered species completed.
d. Minor negative impacts on floodplain functions (site is within the floodplain and floodway).
e. Minor negative impacts on recreation (conflicts with recreational traffic and truck traffic accessing stockpile site).
f. Moderate potential for impacts on cultural resources. Site must be surveyed and coordinated with WISHPO.
g. Minor adverse impacts on socioeconomic resources (safety concerns associated with truck access to the stockpile site and recreational use of existing boat launching ramp).
h. 100 percent (272,500 c.y.) beneficial use removal of material projected.
i. Minor adverse impacts on aesthetic environment (visual intrusion on scenic qualities of the river).

10-644.5-RIE (10.22; Jackson Island) - GREAT I recommended emergency site, CMMP selected emergency site

Site 10-644.5-RIE (10.22; Jackson Island) is a federally owned site lying within the UMRWFR

on Jackson Island. The site has been used in the past for dredged material placement, the last time in 1975. Approximately 75 percent of the site consists of bottomland forest vegetation. The remaining 25 percent of the site consists of bare sand and herbaceous vegetation resulting from a 1984 revegetation project at the site.

Acreage affected under GREAT I = 3 acres of disturbed terrestrial habitat.
Acreage affected under CMMP = 3 acres of disturbed terrestrial habitat.

a. No appreciable adverse impacts on fish and wildlife habitat
b. Minor, short-term adverse impacts on water quality (effluent discharge generated during hydraulic placement would contain elevated turbidity and suspended solids concentrations in the range of 50 to 300 ppm).
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse impacts on floodplain functions (site is within the floodplain and floodway).
e. Minor benefits to recreation from creation of open sandy area adjacent to the river.
f. Moderate potential for adverse impacts on cultural resources. Site must be surveyed and coordinated with IASHPO.
g. No appreciable impacts on socioeconomic resources.
h. No beneficial use removal projected (site would be used for emergency placement of materials).
i. Substantial negative impacts on aesthetics (degradation of the scenic viewshed from Highway 35).

10-643.5-LWI (Jackson Rehandle) - CMMP selected in-water rehandling site

Site 10-643.5-LWI (Jackson Rehandle) is an undefined in-water area approximately 3 acres in size near river mile 643.5. The specific site would be identified based on hydrographic and environmental acceptability. Ideally, an area with a sand bottom and depths less than 12 feet would be chosen. The area would not include high value fishery or mussel habitat. The actual size of the site would depend on the size of the dredging job, river conditions and depth of water at the site. Exact area would be determined after coordination with the OSIT.

Acreage affected under CMMP = 3 acres of main channel border/main channel habitat.

a. Minor adverse impacts on fish and wildlife habitat.
b. Minor, short-term adverse impacts on water quality (in-water rehandling would generate turbidity and suspended solids in immediate vicinity of the site; impacts expected to be short-term and localized).
c. No determination of effects of dredged material placement on Federal threatened and endangered mussel species (site survey and coordination required; see Appendix C).
d. Minor adverse impacts on floodplain functions (site is within the floodplain and floodway).
e. No impacts on recreation.

f. Low potential for adverse impacts on cultural resources. Site must be surveyed for shipwrecks and coordinated with WISHPO.
g. No appreciable impacts on socioeconomic resources.
h. No beneficial use removal projected (site would be used as an in-water rehandling site).
i. No impacts on aesthetics.

10-642.4-LWP (10.40; Mississippi Gardens) - GREAT I recommended primary site, CMMP selected site

Site 10-642.4-LWP (10.40; Mississippi Gardens) is privately owned and lies about 1,800 feet from the river. The site is in an agricultural field bounded by forest, fields and the Burlington Northern Railroad tracks.

Acreage affected under GREAT I = 25.8 acres of agricultural field and disturbance of floodplain forest for site access.
Acreage affected under CMMP = 4 acres of agricultural field and disturbance of floodplain forest for site access.

a. No appreciable impacts on fish and wildlife habitat under either plan.
b. No adverse impacts on water quality (site used limited to mechanical placement).
c. Bald eagle habitats present in site vicinity; further investigation of potential impacts and coordination with USFWS required; see Appendix C).
d. No appreciable impacts on floodplain functions (site is within the floodplain but out of the floodway).
e. No appreciable impacts on recreation.
f. Moderate potential for impacts on cultural resources. Site must be surveyed and coordinated with WISHPO.
g. No appreciable impacts on the social environment.
h. 47 percent (300,000 c.y.) beneficial use removal of material projected under GREAT I; 100 percent (640,000 c.y.) beneficial use removal of material projected under the CMMP.
i. Substantial negative impacts on aesthetics (site is highly visible from Highway 35; major visual intrusion on the scenic qualities of the river viewshed).

10-635.0-LWP (10.43; Prairie Municipal Dock) - CMMP selected site

Site 10-635.0-LWP (10.43; Prairie Municipal Dock) is a previously disturbed dredged material placement site located adjacent to the municipal dock in Prairie du Chien, Wisconsin.

Acreage affected under CMMP = dredging in the East Channel has been deferred and development of this site is not anticipated, however, for planning purposes 5 acres of old dredged material would be used if site use is ever required.

a. No appreciable adverse impacts on fish and wildlife habitat.

b. No appreciable water quality impacts.
c. No adverse impacts on Federal threatened and endangered species.
d. Minor impacts on floodplain functions (site is within the floodplain).
e. No impacts on recreation.
f. Moderate potential for impacts on cultural resources. Survey and coordination with WISHPO required.
g. No appreciable impacts on the social environment.
h. Access to site is good and beneficial use removal of material expected, however, no volume estimates have been determined because of deferred status of dredging.
i. Minor adverse impacts on aesthetic environment.

10-634.6-RIP (10.41) - GREAT I recommended primary site

Site 10-634.6-RIP (10.41) is located about 1,000 feet from the UMR, in an area that has been disturbed by past placement. The site is now vegetated by grasses, sedges and willows.

Acreage affected under GREAT I = 4.5 acres of type 1-2 wetlands.

a. Minor adverse impacts on fish and wildlife habitat.
b. Minor adverse water quality impacts (erosion from site would have an impact on Bloody Run Creek [designated trout stream]).
c. No assessment of impacts on threatened and endangered species completed.
d. Minor impacts on floodplain functions (site is within the floodplain and floodway of Bloody Run Creek).
e. No impacts on recreation.
f. Moderate potential for impacts on cultural resources. Survey and coordination with IASHPO required.
g. No appreciable impacts on the social environment.
h. 100 percent (65,000 c.y.) beneficial use removal of material projected.
i. Minor adverse impacts on aesthetic environment (visual intrusion on Bloody Run viewshed).

10-628.0-LWP (10.01; Wyalusing Pit) - GREAT I recommended primary site, CMMP selected site

Site 10-628.0-LWP (10.01; Wyalusing Pit) is located in an old gravel quarry lying about 1,400 feet from the main channel of the UMR. The site has been used in the past for placement of hydraulically dredged materials.

Acreage affected under GREAT I = 8.2 acres of abandoned quarry habitat.
Acreage affected under CMMP = 6 acres of abandoned quarry habitat.

a. No appreciable impacts on fish and wildlife habitat under either plan.
b. No adverse impacts on surface water quality; potential adverse impacts on groundwater.

c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. No impacts on floodplain functions (site is out of the floodplain and floodway).
e. No impacts on recreation.
f. Site approved for use by WISHPO.
g. No appreciable social impacts.
h. 44 percent (62,000 c.y.) beneficial use removal of material projected under GREAT I; 100 percent (123,000 c.y.) beneficial use removal projected under the CMMP.
i. No impacts on aesthetic environment (site is an abandoned quarry).

10-627.8-LWP (10.24; Wyalusing Beach) - CMMP selected site

Site 10-627.8-LWP (10.24; Wyalusing Beach) is a 2-acre site at the Wyalusing public access. The site has been disturbed by previous placement.

Acreage affected under CMMP = 2 acres of recreational beach habitat.

a. No appreciable impacts on fish and wildlife habitat anticipated, however, additional surveys for endangered species will be required and results of surveys could change this determination.
b. No appreciable impacts on water quality.
c. No determination of effects of dredged material placement on Federal threatened or endangered mussel species (site survey and coordination required; see Appendix C).
d. Minor adverse impacts on floodplain functions (site is within the floodplain and floodway).
e. Minor beneficial impacts on recreation (maintenance of sandy beach area).
f. No cultural resource information available; coordination with WISHPO needed.
g. No appreciable social impacts.
h. No projection of beneficial use under CMMP.
i. No appreciable impacts on aesthetic environment (site is already a beach).

10-618.8-RIP (10.04; Esmann Island) - GREAT I recommended primary site

Site 10-618.8-RIP (10.04; Esmann Island) is a privately owned site in an abandoned sand and gravel pit located on the north end of Esmann Island. The site has been used in the past for dredged material placement, the last time in 1985. The Esmann Island Association has not allowed removal of material and plans to develop the site. The north end of this site contains deep wetland habitat with no aquatic vegetation. Upland vegetation in the immediate area includes willow shrubs, locust and aspen.

Acreage affected under GREAT I = 8.2 acres of type 3-4-5 wetlands.

a. Minor adverse impacts on fish and wildlife habitat
b. No impacts on water quality at the site; minor adverse impacts on water quality (violation of State standards for turbidity) during material rehandling.

c. No assessment of impacts on threatened and endangered species completed.
d. Potential adverse impacts on floodplain functions (site is within the floodplain but out of the floodway).
e. No appreciable impacts on recreation (use of the site for informal swimming would be eliminated).
f. No impacts on cultural resources at the site proper. A moderate potential for impacts on cultural resources along pipeline route. Therefore, a survey of pipeline route is required.
g. Substantial adverse impacts on social environment (Esmann Island Owners Association [site owners] will not allow use of the site).
h. No beneficial use removal of material projected.
i. No appreciable impacts on aesthetics.

10-618.7-RIT (10.18; McMillan Island) - CMMP selected transfer site

Site 10-618.7-RIT (10.18; McMillan Island) is a federally owned site lying within the UMRWFR and located at the head of McMillan Island. Approximately half of this site has been used for dredged material placement. The remainder of the site consists of bottomland forest and shallow aquatic habitat.

Acreage affected under CMMP = 1 acre of type 1-2 wetlands, 1 acre of type 3-4-5 wetland and 3 acres of old dredged material/sand; 5 acres total.

a. Minor adverse impacts on fish and wildlife habitat.
b. Minor, short-term adverse impacts on water quality (effluent discharge generated during hydraulic placement would contain elevated turbidity and suspended solids concentrations in the range of 100 to 500 ppm).
c. No adverse impacts on threatened and endangered species.
d. Minor adverse impacts on floodplain functions (site is within the floodplain and floodway).
e. No appreciable impacts on recreation (open sand area adjacent to the river could provide benefits to camping and picnicking).
f. Low potential for adverse impacts on cultural resources. Site has been surveyed; coordination with ISHPO must be finalized.
g. No appreciable social impacts.
h. No beneficial use removal of materials projected (site would be used as a transfer/rehandling site).
i. Minor negative impacts on aesthetics (containment dike would be visually intrusive).

10-618.0-RIP (Buck Creek) - CMMP selected site

Site 10-618.0-RIP (Buck Creek) is a privately owned site currently used for agricultural purposes. The field is adjacent to the Buck Creek floodplain and is surrounded by reed canary grass, willows, and cottonwoods.

Acreage affected under CMMP = 2 acres of type 1-2 wetlands and 8 acres of agricultural field; 10 acres total - hydraulic pipeline would cross wetland on upstream end of Esmann Island.

a. Minor adverse impacts on fish and wildlife habitat.
b. Minor adverse impacts on water quality of Buck Creek.
c. No adverse impacts on Federal threatened and endangered species (see Appendix C).
d. Minor adverse impacts on floodplain functions (site is within the floodplain and floodway of Buck Creek).
e. No appreciable impacts on recreation.
f. No impacts on cultural resources. Site was surveyed in 1994 with negative results. Coordination with ISHPO must be finalized.
g. No appreciable impacts on the social environment.
h. 33 percent (175,000 c.y.) beneficial use removal of material projected.
i. Minor, long-term impacts on aesthetics (changed land-use).

10-617.7-RIP (Esmann Island Agricultural Land) - considered, but not selected for CMMP

Site 10-617.7-RIP (Esmann Island Agricultural Land) was used for dredged material placement prior to its development by the Esmann Island Association. The Association no longer wants the site used.

Acreage affected under CMMP = the site is not proposed for use under the CMMP, however, approximately 25 acres of agricultural field habitat were considered for dredged material placement under the dredged material placement reconnaissance report for lower pool 10.

a. No appreciable impacts on fish and wildlife habitat.
b. Minor, short-term adverse impacts on water quality (effluent discharge generated during hydraulic placement would contain elevated turbidity and suspended solids concentrations; effluent discharged to Frenchtown Lake backwater).
c. No assessment of impacts on threatened and endangered species completed.
d. No adverse impacts on floodplain functions.
e. No appreciable impacts on recreation.
f. Potential for significant adverse impacts on cultural resources as there are known cultural resources in sites at this location.
g. Significant adverse impacts on the social environment (site use would negatively affect land use, aesthetics, residential development and transportation).
h. 33 percent (175,000 c.y.) beneficial use removal of material projected.
i. Significant adverse impacts on aesthetics (stockpile and truck traffic to and from the site would be visually and audibly intrusive to the surrounding residential area).

10-616.0-RIP (10.03) - GREAT I recommended secondary site

Site 10-616.0-RIP (10.03) is located inside the Guttenberg flood control dike at the north end of the city. The site is bounded by a railroad and highway about 800 feet from the river.

Acreage affected under GREAT I = this site would not be needed, is no longer available or is a conditional substitute under GREAT I, however, approximately 10 acres of agricultural field habitat were proposed for use under GREAT I.

a. No appreciable impacts on fish and wildlife habitat.
b. No impacts on water quality.
c. No assessment of impacts on threatened and endangered species completed.
d. No adverse impacts on floodplain functions.
e. Minor adverse impacts on recreation (site is currently used as a soccer field).
f. Low potential for adverse impacts on cultural resources; however, the site must be surveyed and coordinated with ISHPO.
g. Minor adverse impacts on the social environment (potential noise and disturbance of local residential areas; truck traffic through Guttenberg would increase during placement operations).
h. Material would be available for beneficial use removal.
i. Minor adverse impacts on aesthetics (stockpile and placement site would be visually intrusive).

10-615.5-RIP (10.02) - GREAT I recommended primary site

Site 10-615.5-RIP (10.02) is a 6-acre site in the city of Guttenberg, Iowa. The site is an open field bounded by developed areas and wetlands. Part of the site is mowed and maintained as a soccer field while part of the site is a wetland.

Acreage affected under GREAT I = 5.5 acres of disturbed terrestrial habitat.

a. No appreciable impacts on fish and wildlife habitat.
b. No impacts on water quality.
c. No assessment of impacts on threatened and endangered species completed.
d. No adverse impacts on floodplain functions.
e. No adverse impacts on recreation.
f. Moderate potential for cultural resources impacts; survey required before use.
g. Minor adverse impacts on social environment (potential noise and disturbance to area residents from truck traffic to placement area).
h. 22 percent (12,000 c.y.) beneficial use removal of materials projected.
i. Minor adverse impacts on aesthetics.

B-14.2.4 Comparison of Plans

Neither plan would have significant adverse water quality impacts (Tables B-43 and B-44) because the main channel sediments in pool 10 are relatively uncontaminated and most impact events would be of short duration (2 to 3 days).

Under the GREAT I plan, 12.5 acres of bottomland forest, 8.2 acres of shallow/deep emergent marsh, 25.8 acres of agricultural field, 10 acres of disturbed terrestrial habitat, and 8.2 acres of abandoned quarry habitat would be converted to dredged sand habitat. Comparable figures for the CMMP include: 5 acres of bottomland forest, 1 acre of shallow marsh, 3 acres of open water, 8 acres of old dredged material, 12 acres of agricultural field, 5 acres of disturbed terrestrial habitat, 6 acres of abandoned quarry and 2 acres of recreational beach habitat. The CMMP would result in disturbance of fewer wetland acres (9 acres) than the GREAT I plan (20.7 acres). Overall the CMMP would disturb 42 acres while the GREAT I plan would disturb 64.7 acres.

Four sites selected under the CMMP have potential to affect threatened and endangered species (Table B-44), however, no determination of the level of impacts have been made at this time. Further investigations of potential impacts and coordination with the USFWS will be necessary. No assessment of the effects of the GREAT I plan on threatened and endangered species has been completed (Table B-43).

Because of the high potential for archeological sites being located in pool 10, both plans would require further archeological survey work and cultural resource coordination. Under the CMMP, four sites would require survey work and two would require coordination to finalize approval. Given previous work on the latter two sites, approval should be forthcoming. Under GREAT, six sites would require survey work and one would require coordination to finalize. Overall, the GREAT plan, with the survey work required for site 10-646.5-LWP (10.16; Gordon's Bay Landing), would require more cultural resource work, but the potential to affect cultural resources cannot be determined without further analysis.

SITE	GREAT	CMMP	SECTION 106 STATUS
10-647.1-LWP (10.17; Varo Property)	X	X	Survey needed
10-646.5-LWP (10.16; Gordon's Bay)	X		Survey needed
10-644.5-RIE (10.22; Jackson Island)	X	X	Further survey work needed
10-643.5-LWI (Jackson Rehandle)		X	Further survey work needed
10-642.4-LWP (10.40; Miss. Gardens)	X	X	Survey needed
10-635.0-LWP (10.43; Prairie Mun. dock)		X	Survey needed
10-634.6-RI (10.41)	X		Further survey work needed
10-628.0-LWP (10.01; Wyalusing Pit)	X	X	Approved
10-627.8-LWP (10.24; Wyalusing Beach)		X	Coordination needed.
10-618.8-RIP (10.04; Esmann Island)	X		Surveyed, need to finalize coord.
10-618.7-RIT (10.18; McMillan Island)		X	Surveyed, need to finalize coord.
10-618.0-RIP (Buck Creek)		X	Surveyed, need to finalize coord.
10-615.5-RIP (10.02)	X		Further survey work needed

<u>GREAT</u> 8 disposal sites

1 approved
6 require surveys and coordination
1 requires final coordination

<u>CMMP</u> 9 disposal sites

1 approved (one conditionally)
5 require surveys and coordination
3 require coordination

Table B-43. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

POOL 10 - GREAT

	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values					X		
3. Recreational Opportunities				X			
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use				X			
10. Controversy					X		
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services			X				
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply			X				
8. Commercial Navigation			X				
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands					X		
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				U*			
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

Table B-44. ENVIRONMENTAL ASSESSMENT MATRIX

Section 122 of the River and Harbor and Flood Control Act of 1970 (P.L. 91-611)

POOL 10 - CMMP

	MAGNITUDE OF PROBABLE EFFECTS						
	BENEFICIAL EFFECT			NO APPRECIABLE	ADVERSE EFFECT		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. SOCIAL EFFECTS							
1. Noise Levels					X		
2. Aesthetic Values					X		
3. Recreational Opportunities				X			
4. Transportation			X				
5. Public Health and Safety				X			
6. Community Cohesion (Sense of Unity)				X			
7. Community Growth & Development				X			
8. Business and Home Relocations				X			
9. Existing/Potential Land Use				X			
10. Controversy					X		
B. ECONOMIC EFFECTS							
1. Property Values				X			
2. Tax Revenues				X			
3. Public Facilities and Services			X				
4. Regional Growth				X			
5. Employment				X			
6. Business Activity				X			
7. Farmland/Food Supply			X				
8. Commercial Navigation			X				
9. Floodplain Effects				X			
10. Energy Needs and Resources				X			
C. NATURAL RESOURCE EFFECTS							
1. Air Quality				X			
2. Terrestrial Habitat					X		
3. Wetlands					X		
4. Aquatic Habitat					X		
5. Habitat Diversity and Interspersion					X		
6. Biological Productivity					X		
7. Surface Water Quality					X		
8. Water Supply				X			
9. Groundwater				X			
10. Soils					X		
11. Threatened or Endangered Species				X	U*		
D. CULTURAL RESOURCE EFFECTS							
1. Historic Architectural Values				X			
2. Pre-Historic and Historic Archeological Values				U*			

* U = undefined or undetermined for the current stage of planning.

B-15.0 COMMERCIAL AND SMALL-BOAT HARBORS

B-15.1 SITE-SPECIFIC IMPACTS OF DREDGING

Because of infrequent and small volume dredging requirements, no specific long-term placement planning was completed for the commercial and small-boat harbors maintained by the St. Paul District. The harbors maintained by the District are as follows:

Harbor	Location (River Mile)
St. Paul small-boat harbor	RM 839.6
Hastings small-boat harbor	RM 813.2
Red Wing commercial harbor	RM 791.5
Red Wing small-boat harbor	RM 791.0
Lake City small-boat harbor	RM 772.5
Pepin small-boat harbor	RM 767.0
Wabasha small-boat harbor	RM 760.5
Alma small-boat harbor	RM 754.0
Winona commercial harbor	RM 726.3
Winona small-boat harbor	RM 726.1
Lansing small-boat harbor	RM 663.5

Most harbors would be mechanically dredged because of the small volumes normally removed and the increased flexibility in handling material at the placement site. Mechanical dredging would be required at several harbors because of the excessive distance from the harbor to the proposed placement site or because of placement site size limitations. The effects of dredging the small-boat and commercial harbors listed above are summarized below.

a. Minor short-term disturbance to benthic invertebrates and fish; maintenance of deep water beneficial to fish.
b. Minimal adverse impacts on water quality.
c. Negligible impacts on freshwater mussels (mussel resources typically not located in harbors).
d. No adverse effects on Federal threatened and endangered species (see Appendix C).
e. Minor, short-term disruption of recreational traffic; long-term benefits to recreation from maintenance of recreational boat harbors.
f. No impacts on cultural resources; as with the dredging of the main navigation channel, dredging of commercial and small-boat harbors would have relatively little effect on in-water resources. These harbors have been dredged in the past and little potential exists for undisturbed resources. Any expansion of these harbors would require State Historic Preservation Office (SHPO) review.
g. No appreciable adverse impacts on socioeconomic resources (potential short-term delays to commercial navigation); long-term benefits to commercial navigation and local economies from maintenance of commercial harbors.

B-15.2 SITE-SPECIFIC IMPACTS OF DREDGED MATERIAL PLACEMENT

Because of infrequent and small volume dredging requirements, no specific long-term placement planning was completed for the commercial and small-boat harbors maintained by the St. Paul District. Material dredged from these harbors would be placed at the nearest selected long-term placement site for main channel dredging. Dredged material disposal would have the same impacts as those discussed for each site earlier in this appendix, as follows:

Harbor	Selected Placement Site	Report Section
St. Paul small-boat harbor (RM 839.6)	2-840.4-RMP (2.16; Highbridge)	B-4.0
Hastings small-boat harbor (RM 813.2)	3-815.1-RME (Hastings)	B-6.0
Red Wing commercial harbor (RM 791.5)	4-791.6-RMP (4.57; RW Comm. Hbr.)	B-7.0
Red Wing small-boat harbor (RM 791.0)	4-791.6-RMP (4.57; RW Comm. Hbr.)	B-7.0
Lake City small-boat harbor (RM 772.5)	4-762.7-LWT (4.29; Reads Landing)	B-7.0
Pepin small-boat harbor (RM 767.0)	4-762.7-LWT (4.29; Reads Landing)	B-7.0
Wabasha small-boat harbor (RM 760.5)	4-762.7-LWT (4.29; Reads Landing)	B-7.0
Alma small-boat harbor (RM 754.0)	4-754.0-LWP (4.02; Alma Marina)	B-7.0
Winona commercial harbor (RM 726.3)	6-726.3-RMP (Winona Comm. Hbr.)	B-10.0
Winona small-boat harbor (RM 726.1)	6-726.0-LW (6.27; Winona Harbor)	B-10.0
Lansing small-boat harbor (RM 663.5)	9-663.5-LWP (Lansing Hwy. Brdg.)	B-13.0

Most harbors would be mechanically dredged because of the small volumes normally removed and the increased flexibility in handling material at the placement site. Mechanical dredging would be required at several harbors because of the excessive distance from the harbor to the proposed placement site or because of placement site size limitations.